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NATIONAL CAR AND LOCOMOTIVE BUILDER

JANUARY, 1891.

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N. Y., P. & B. specifications are out for ten coaches and six locomotives.

The New Jersey & New York Railroad are in the market for several new coaches.

Wisconsin Central are about to place contracts for considerable freight equipment.

It is stated that the Delaware & Hudson will place an order this winter for 25 first-class coaches.

The B. & O. 500 freights have not as yet been let, but probably will shortly after the close of the year.

It is stated upon very good authority that the Northern Pacific is about to let contracts for 10,000 cars.

The Staten Island Rapid Transit have also asked for additional freight and passenger cars; also a number of locomotives.

The Southern Pacific system are in want of additional equipment, and are considering contract for a large number of freight cars.

At the January meeting of the New England Railroad Club the subject for discussion will be, What Constitutes a Defect in a Vertical Plane Coupler? Some interesting information is expected on the subject of car couplers.

The Richmond & Danville system have countermanded some of their freight equipment orders for the reason that the contractors were behind in deliveries; so much so that the cars could not be utilized for the heavy fall trade.

The Delaware, Lackawanna & Western have just closed contract with Jackson & Woodin, of Berwick, for 1,000 cars and the Butler Car Works for 1,000. These are supposed to be equally divided between box and gondolas. They have ordered 17 locomotives from the Dickson company and 10 first-class coaches from Pullman.

The compartment system for cars in general use in Europe offers enticing opportunities for the perpetration of robberies, murders and outrages upon solitary passengers which is frequently taken advantage of. The latest compartment car outrage reported was on the Southern Railway of France, where a lady was gagged and robbed.

An unusual form of railroad accident happened on the Baltimore & Ohio near Pittsburgh last month. A switching crew left some cars on the main track at night and went away some miles to do switching in another yard. On returning, the switch engine ran into the cars left on the main track, making a very bad wreck and severely injuring four or five persons.

During last year, the Cumberland & Pennsylvania Railroad Company, which are the successors of the Mount Savage Locomotive Works Company, built in their shops at Mount Savage, Md., two consolidation locomotives with cylinders 20×24 inches, and having a total weight of 103,000 pounds on the drivers. The work was done under the supervision of Mr. Henry T. Bruck, master of machinery, who is noted as a particularly capable and systematic shop manager.

Certain financial journals with no conscience worth mentioning, respecting the relations of meum and tuum, got in the habit of calling a particularly daring thief a Napoleon of Finance. There was a night operator belonging to the Northern Pacific, recently sent to his natural home, the States prison, who deserved to be called the Alexander, Julius Cæsar, Jack Sheppard Napoleon of Finance, for he was only two nights in the service of the company and in that time he stole $2,000 worth of tickets.

The Atchison, Topeka & Santa Fe Railroad mechanical department have determined to rebuild the Strong locomotive which they have got. They will put an ordinary fire box in the place of the Fox furnaces now used, put in another pair of driving wheels in place of the small carrying wheels under the bed plate and apply the link motion instead of the radial gear which was a prominent feature of the engine. New cylinders will be applied with the arrangements for making the engine compound.

On Dec. 9 the boiler of a locomotive in the Reading Railroad roundhouse at Philadelphia, exploded, completely demolishing the locomotive and badly wrecking another that was standing near by. The force of the explosion sent parts of the engine through the roof and blew out one side of the roundhouse. A number of workmen were in the building at the time, but they were fortunately some distance away and escaped unhurt. On the same day the boiler of a freight engine on the Housatonic Railroad exploded near Hartford, Conn. The engineer and fireman were hurt, but not fatally.

One of the most curious things we have read for some time was in correspondence, where the head of a firm making articles for railroad use was discussing for the benefit of his subordinates scandalous schemes to corrupt the men who are influential in the purchase of the supplies. In one letter he mentions that it was Sunday and he was too sick to go to church, but he felt that the Lord was on the side of his firm and that they would succeed in getting there. The result of the scheme was that the subordinates made lots of money which they pretended were paid out as commissions.

There is every indication that the low-roofed, small-windowed, malodorous car usually provided for the accommodation of smokers will soon be a thing of the past. The new cars built for all first-class roads have now a separate smoking compartment, where men using the weed may sit in comfort without having to traverse the train in search of a car devoted exclusively to smoking. The practice is meeting with the commendation of travelers, and the railroad companies that cling to the practice of devoting their worn-out cars for the accommodation of smokers are advertising themselves in a fashion that is not likely to have a healthy effect upon their passenger business.

The Canadian Locomotive and Engine Company, Kingston, Ont., are crowded with work. They are constructing five-wheel locomotives for the Canadian Pacific railway. They will weigh when ready in the neighborhood of fifty tons. They are also building ten heavy standard mogul engines for the Grand Trunk railway. Four locomotives, with side tanks, weighing ninety tons each, have been commenced for the Chignecto Marine Transport Railway, Amherst, N. S., and five standard eight-wheelers, forty-three tons weight, will be built to be kept in stock. These with other small contracts are expected to keep the works busy till the middle of 1891. There are three hundred men employed.

Professor William D. Marks recently lectured at the Franklin Institute, Philadelphia, on "Two and a half miles a minute," as speed for railroad trains. The Professor did not give any points that are new to engineers, but he is very hopeful of great train velocities in the near future and anticipates seeing trains run the 89 miles beween New York and Philadelphia in 36 minutes. When there is a general demand among the traveling public for a train speed of 150 miles an hour the probability is that means will be devised to satisfy that want as most others have been attended to; but we do not see any inclination to call for an average speed of one mile a minute, which is perfectly practical with present railroad rolling stock.

Mr. Charles Watts, superintendent of the Chicago division of the Pittsburgh, Fort Wayne & Chicago road, claims that the fastest time ever made on an American railway was on that road recently. His official report showed that a special train ran 53 miles in 45 minutes, 11 miles of which was covered in seven minutes, or at an average speed of 94 miles an hour. The train sheets show that the above statement is correct. We believe that Mr. Watts veracity is as unspotted as the Father of our country; but we would like to hear from the next superintendent who keeps a close record of fast running. We believe in train sheets, and that is why we give other people an opportunity to beat this record.

As train No. 5, west bound, on the Chicago & Grand Trunk, pulled into Nicholas one morning last month, the Baker heater in the first-class coach exploded, filling the car with gas and burning coal. Two men jumped out of the windows and were severely cut. The windows were quickly broken out. This saved the passengers from suffocation. The wood work and seats in several parts of the coach caught fire, and before they were extinguished badly damaged the car and burned several passengers. Great surprise has been expressed about the cause of the accident, but there is no real mystery attached to it. The safety valve got stuck and a bursting pressure of steam was generated, or a pipe was frozen preventing the pressure from being relieved by the safety valve.

The freight cars belonging to the Central Railroad of New Jersey are obtaining a most unenviable reputation for causing accidents through weakness of the draft attachments. The cars are designed as if the intention was to invite breakage. The center sills and draft timbers are ten inches apart. This distance is spanned by followers one inch in thickness, and jaws made of very light iron as well. To make certain of giving the weak parts more burden than they can safely carry, a wrought iron drawbar 40 inches long is employed with an 8-inch pocket, made of 3 × ⅞ inch wrought iron. Some of our Western friends have clubs ready with which to welcome the designer of these cars if they can ever lay hands on him. We have received a very fierce letter denouncing the company that is responsible for endangering the lives of men who couple these cars, and we are glad to pass the matter mildly along by giving particulars of the draft gear. If a new design is not forthcoming soon we shall willingly express ourselves with becoming vigor.

When a young man graduates from a college there is an impression that he is well educated and possessed of sufficient knowledge to make him useful and worthy of his hire in any commercial establishment. This is a mistake. Through the faults of the educational systems prevailing, the knowledge imparted is very often of the kind that practical men do not require, and the subjects that a young man ought to be most familiar with have generally been neglected. A highly practical Southern business man, lately dilating on this subject, said: "How many college boys are there in Georgia who can tell what kind of native timber will bear the heaviest burdens? or why you take white oak for one part of a wagon and ash for another? or what timber will last longest under water, and what out of the water?" That is only the beginning of a string of questions respecting common things that many graduates of colleges North and South would fail to answer. The mechanic arts are becoming of paramount importance in this country, and it is high time that the rising youth was educated in matters bearing on industrial life.

Those leeches of transportation business, the express companies, have been badly worsted in the highest court in the land in an attempt to legalize the practice of charging for the transportation of packages according to the value of the article. The charges as a rule are monstrously high for every sort of package and the practice of grading the tariff upward when the article was of greater value than waste paper was merely extortion. A lady brought suit against the Adams Express Company to recover for the loss of a package containing a sealskin cloak. The express company refused payment on the ground that the package was of extraordinary value, but bore no mark to distinguish it from an ordinary package of merchandise; further that the company did not receive payment for the transportation of the package according to its valuation, as it should when money and valuables are intrusted to its care. The case was tried in the lower courts, which sustained the claim of the prosecutors. The Supreme Court sustained the action of the lower courts, and the company will have to pay the claim. The decision also covers a similar case recently brought from Hamilton County, in which the claim was made for the loss of jewelry.

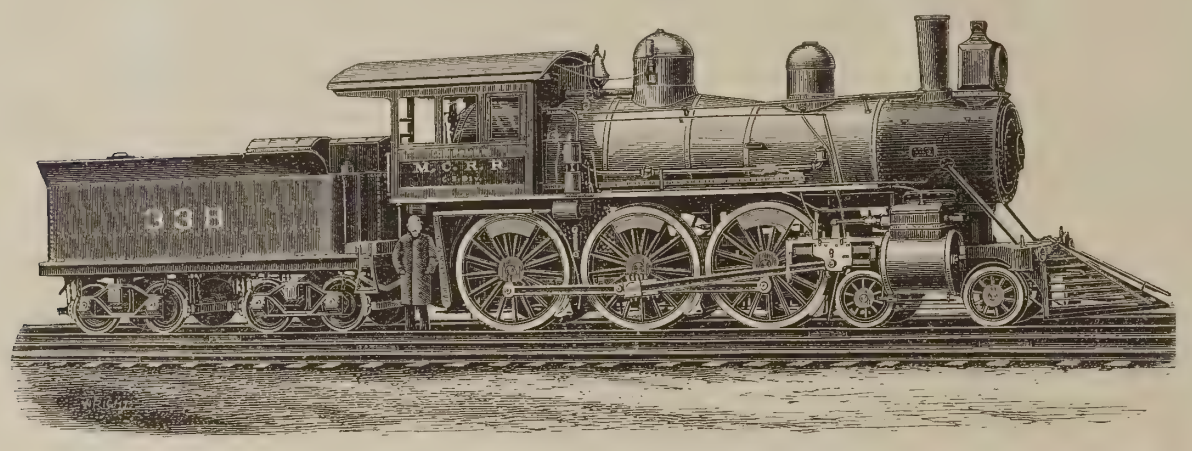
There are some newspaper items that remind us of the Wandering Jew. Their life is about as persistent and their vitality is generally in direct ratio to their veracity. The latest peripatetic of this kind is called the "curiosities of magnetism." It goes on to say that "statistics go to show that in the matter of steel rails, as many as 13 will become crystallized and break where they go to make up a railroad track running east and west, before one of those on a north and south track is similarly affected. This is entirely due to the magnetism generated by friction, and the fact that the polarity of the magnetic current is in the former instance resisted in the headlong rush of the train, whereas in the latter case it is undisturbed. Another strange effect of this peculiar and occult force is that exerted on the watches of the trainmen. A timepiece carried by the conductor running a train 20 miles an hour, however accurate it may be, will, if the speed of the train is increased to, say, 50 miles, become useless until regulated. The magnetism generated by the flight of a train may be said to be in proportion to the speed with which it is propelled, and the delicate parts of a watch, numbering all the way from 400 to 1,000 pieces, and peculiarly susceptible to this influence by reason of the hammering and polishing they have received, are not slow to feel the effect." We suppose that some one must have believed all that rot when it was published as scientific facts, yet not a word of it is true. Or at most it is a web of fiction woven on a single thread of truth.

Michigan Central Compound Passenger Locomotive.

Annexed engraving gives perspective view of a ten-wheel compound locomotive recently built by the Schenectady Locomotive Works for the Micnigan Central Railroad Company, and used for the heavy fast passenger trains on the Michigan Southern division. When the first compound locomotive built for the Schenectady Locomotive Works, fully described in the NATIONAL CAR AND LOCOMOTIVE BUILDER of February last, was put in service it was found that several changes had to be made before she would pull fast passenger trains satisfactorily. That engine is now doing very good work on passenger service, but the experience gained with her indicated that increased economy and efficiency would be likely to result from diminished piston speed. Several other minor improvements were found to be desirable, and the engine illustrated was designed to meet all requirements, and may be regarded as the most advanced form of compound locomotive yet built. The engine is quite heavy, having a total weight of 135,000 pounds in working order, 99,000 pounds of which rests on the drivers. The high pressure cylinder is 20 inches diameter and the low pressure cylinder 29 inches diameter, the stroke of both being 24 inches. The steam ports of the high pressure cylinder are $2\frac{1}{2} \times 18$, while the exhaust port is 3 inches wide. The steam ports of the low pressure cylinder are $2\frac{1}{2} \times 20$ inches and the exhaust port 3 inches wide. The slide valves have a travel of $6\frac{1}{2}$ inches, outside lap, $1\frac{1}{8}$ inch. The high pressure valve has $\frac{1}{4}$ inch and the low pressure $\frac{3}{16}$ inch inside clearance. The driving wheels are 74 inches diameter.

The driving boxes are of phosphor bronze, and the springs are hung underneath. The driving wheel axle journals are $7\frac{1}{2} \times 9$ inches, and those of the engine truck $5\frac{1}{2} \times 9$ inches. The main pin bearings are $5\frac{1}{2} \times 5\frac{1}{2}$ inches, the intermediate side rod bearing is $5\frac{1}{4} \times 5$ inches and the front and back bearings $4 \times 3\frac{7}{8}$ inches.

The boiler is an admirable specimen of the designers' and the boiler makers' art, being constructed to stand a working pressure of 180 pounds to the square inch. It is of the extended wagon top type, 58 inches diameter at the smallest ring. The outside shell of the boiler and fire box is steel $\frac{9}{16}$ and $\frac{5}{8}$ inch thick. The fire box is $96\frac{3}{16}$ inches long, $42\frac{1}{4}$ wide and $67\frac{3}{4}$ inches deep in the front. The boiler has 272 tubes 2 inches diameter and 13 feet long. The heating surface of the fire box is 153 square feet, and of the tubes 1,839.58 square feet, making a total of 1,992.58 square feet.



NEW MICHIGAN CENTRAL COMPOUND LOCOMOTIVE.

St. Paul Ten-Wheel Passenger Locomotive.

Our inset is a woodcut giving a prospective view of a ten-wheel passenger locomotive built by the Rhode Island Locomotive Works for the Chicago, Milwaukee & St. Paul, and used very successfully on that railroad for hauling heavy fast trains between Chicago & Milwaukee. The passenger business between these cities is particularly hard to handle, the engines being required to haul 12 or 15 cars a distance of 85 miles in $2\frac{1}{2}$ hours and make ten stops on the way. A great many different kinds of locomotives have been tried for this severe service and the engine illustrated has given the greatest satisfaction.

The engine is very well designed for the peculiar combination of requisites called for by the business. The total weight in working order is 113,500 pounds, of which 85,000 pounds is on the drivers giving a little more than 14,000 pounds per wheel while the truck carries 27,500 pounds; a fairly light load but sufficient for safety. The cylinders are 19×24 inches and they transmit power to driving wheels 64 inches diameter. The driving wheel base is 14 feet 8 inches and the total wheel base 24 feet 11 inches. The following are a few of the leading specifications of the engine:

Boiler of Otis steel $\frac{1}{16}$-inch thick, throat $\frac{5}{8}$, riveted with $\frac{7}{8}$-inch rivets placed not over $2\frac{1}{4}$ inches from center to center, all circular seams and junction of waist and fire box double riveted, all longitudinal seams provided with butt joints. Boiler tested with 235 pounds to the square inch, steam pressure. Waist, 56 inches in diameter at smoke box end, made wagon top, with extension arch, with one dome 30 inches diameter placed on wagon top.

Tubes of charcoal iron, 236 in number, two inches outside diameter and 11 feet 10 inches in length, with copper ferules on fire box end.

Fire box of Otis steel, 78 inches long and $34\frac{1}{8}$ inches wide; side, $\frac{5}{16}$ and back sheets $\frac{3}{8}$ inch thick; crown sheet, $\frac{3}{8}$ inch thick; flue sheet, $\frac{1}{2}$ inch thick. Water space, $3\frac{1}{2}$ inches wide at sides, $3\frac{1}{2}$ inches wide at back and $3\frac{1}{2}$ to $4\frac{1}{2}$ inches wide at front; stay bolts, $\frac{7}{8}$ and 1 inch diameter, screwed and riveted to sheets, and not over $4\frac{1}{4}$ inches from center to center; drilled telltale above frame. Crown supported by crown bars, each made of two pieces of $5\frac{1}{2} \times \frac{3}{4}$-inch wrought iron, placed not over $4\frac{1}{2}$ centers. Crown bar bolts, $\frac{7}{8}$ diameter, with flat heads under the crown sheet, the fit in the crown sheet to be tapered and drawn to its place by a nut above the crown bar. Grates, cast iron, rocking and dump. Ash pan, wrought iron, dampers front and back.

Piston heads and followers of cast iron, fitted with cast iron spring ring packing; piston rods of cold rolled steel, keyed to crossheads, forced and riveted to piston.

Guides of cast iron gun metal.

Crosshead of cast steel, with brass gibs.

Driving wheels, six in number, 64 inches in diameter; centers of cast iron, with hubs and rims cored out and turned to 57 inches diameter to receive tires. Tires of standard steel $3\frac{1}{2}$ inches thick; first and third pairs flanged $5\frac{3}{4}$ inches wide; second pair, plain, $6\frac{1}{2}$ in. wide.

Axles of Otis steel; journals, $7\frac{1}{2}$ inches diameter, and 8 inches long.

Rods—Connecting and parallel rods of Otis steel, forged solid, with fork end on main rod; parallel rods with solid ends; rod boxes, phosphor bronze.

Crank pins of hammered iron, case hardened.

Feed water supplied by one monitor, No. 9, R. H. style, 1888, and one Sellers, No. 9, L. H. style, 1876. All piping copper.

Engine truck, center-bearing, swiveling, four-wheel swing motion truck. Truck frame and braces of wrought iron, with cast iron cross spider fitted with swinging bolster and cast iron pedestals. Wheels, four double plate chilled wheels of approved make, 23 inches diameter.

Axles—Axles of best hammered iron, with inside journals 5 inches in diameter and 8 inches long.

Ignorance Respecting the Link Motion.

After quoting part of the article which appeared in last number of the NATIONAL CAR AND LOCOMOTIVE BUILDER on mistakes made in the designing of link motion, and commenting on it, the *Railway Review* adds:

"We know of a recent case where a newly appointed chief draughtsman of a railroad designed a new class of locomotive and employed a valve motion, which he considered well suited to the case. When the drawings of the link motion arrived in the machine shop they excited great curiosity because the saddle pin was offset from the center of the link, and when it came to the master mechanic's knowledge that a drawing of that nature had been sent into the shop, he immediately called a halt in the work and proceeded to interview his draughtsman. The draughtsman was very confident that he knew how to design a link motion, but the master mechanic insisted that he had experimented time and again with link saddles whose pins were located in all conceivable positions, and he never found any difference whatever in the motion, and consequently had for years adopted the practice of putting every saddle pin centrally on the link, and he believed that it was the only way in which it could be constructed. We are happy to say that the draughtsman carried the day, and obtained his own way in the matter, but not until he had made a pair of saddles and conducted a series of experiments to demonstrate the correctness of his position. It is quite certain that if a committee made an intelligent and concise report to the convention upon the best proportions of link motions, and defined clearly the effect of various changes, such as increasing or diminishing the length of eccentric rods, altering the length of the reverse shaft arms, or of suspension links, or changing the position of saddle pins, etc., it would be well received and prove exceedingly valuable to those who have not a correct knowledge of the effect of such changes. Such a report need not take up the question of the link vs. the other motions, or of other and time worn features of valve motion discussions, but should simply confine itself to a brief statement of the best proportions and the results to be expected by a deviation from them."

Small Wheels Incline to Cut Flanges.

If you will pardon me, I would like to digress from car trucks and the ordinary 33 inch wheels, of which so many are used, and call the attention of the master mechanics to the difference in the wear of flanges of the tires of their driving wheels on their engines, those having large and those having small sized driving wheels; and I can safely say that there are ten flanges on small sized drivers cut to one on large sized drivers, and the difference is not always on six or eight-wheel driver engines, but often on four-wheeled engines, and the same rule to my mind holds good regarding the large and small wheels under cars and drivers under locomotives, that the chances of flange wear are lessened directly in proportion to the increased distance from rail to center of axle.

Were our railways perfect planes, we would then be able to carry the center of our boilers to almost any height, and there would be less lateral wear upon boxes than there now is, and would lessen the danger of an engine turning over and lessen the strain upon the flanges of wheels.

Our master mechanics will agree with me, by changing the center of gravity from a point midway between wheels to a point directly over the rail, as would be the case on curves, that we would have practically no limit as to the height we could make the centers of boilers. It is simply the principle developed in the bicycle of to-day, and it is this principle that should be borne in mind in constructing not only locomotive work, but freight or passenger car trucks.—*D. J. Durrel at Western Railway Club.*

Narrow Escape on Elevated Railroads.

The Elevated Railroads of New York have been celebrated for the remarkable exemption from serious accidents that has attended the operating of the lines crowded with trains that have no parallel on any railroad in the world; but last month they had two remarkably narrow escapes from disaster. In one case a switchman at night signaled an engine to pass from a siding to the main line without noticing that a train was approaching and a side collision happened which almost sent the train into the street. Nothing but the narrow sidewalk provided for trackmen prevented the engine of the passenger train from falling off the structure. Had the engine gone down the cars would have followed.

On another day an engine blew out a cylinder head, and the train was stopped while the engineer engaged in disconnecting the side road. While this was going on another train ran into the end of the delayed train, and struck such a heavy blow that the throttle of the engine was jerked open and, the engineer and fireman being off, the engine ran away with the train. A plucky passenger climbed out of the front car and stopped the engine, thus averting what might have been a frightful accident.

Two years' experience at the Brooklyn bridge upon the comparative cost of cable haulage and of locomotive haulage shows that, while the cost per car-mile is in the case of cables but 3.77 cents, that by locomotives is 32.16 cents. It must, however, be remembered that Brooklyn bridge is especially favorable to cable work.

We have heard lately of some locomotive repair shops where portable incandescent lights are used for lighting up all places that are dark in day time. They are used by boilermakers in fire boxes and boilers, inside tenders, and for shedding light upon operations inside the smoke box. Machinists also use them for dispelling the darkness from the inside of cylinders and other parts where increase of light is something to be desired. We are persuaded that it would pay the companies to introduce an electric dynamo for this purpose alone in all large shops. The amount of extra work done would more than pay for the outlay.

Mr. James Hill, president of the Great Northern Railroad, is a good practical railroad man, and he appears to hold a highly business-like estimate of the idiotic practices that make railroads poor in the midst of riches, that keep railroads toiling beyond their capacity for labor without any fair reward for work accomplished. In a recent newspaper interview Mr. Hill is reported to have said: "Every road going out of Chicago is carrying its full capacity. One of the presidents told me the other day that they were literally crushed with business, yet they are not making money. I tell you the sooner the stockholders of the companies take hold of the matter the better they will be off. If they would pay five traffic agents in Chicago $100,000 a year apiece to get out of town, to clear out altogether, keep away from the roads entirely, they could make big money. These fellows (traffic agents) seem to think that railroads are not intended to be operated for the benefit of the stockholders, but just to give them (the agents) a chance to square some petty grievance against some other traffic agent, so the cutting of rates goes on, and they draw their $20,000 a year to keep it going. I wouldn't have one of them working on my road as a brakeman even. I'd kick him off the premises. The situation of the Western roads will not improve until they get rid of these fellows." That is pretty strong language, but it is all true.

In New England.

EDITORIAL CORRESPONDENCE.

THE PROGRESSIVE EAST.

At the last meeting of the New England Railroad Club our energetic friend Mr. Lauder inflicted a most vigorous reproof to a speaker who had the audacity to make disparaging remarks about the conservative tendency of Eastern railroad men. I must confess that I have several times laid myself open to the same reproof, but the more I see of Eastern railroads the more I am disposed to change an opinion hastily formed to the effect that Eastern men generally waited till a good thing was old in the West before they adopted it. That is not correct. I am beginning to find that many Eastern roads are pioneers in the use of progressive appliances and methods that many Western railroad men have never seen and have seldom heard about. I met with a great surprise during a recent visit to Boston.

INTERCHANGEABLE PARTS THAT DO NOT INTERCHANGE.

For the last twelve or fifteen years we have all heard about railroad shops that follow the practice of making all parts of locomotives according to standard sizes; we have all heard a great deal about the economy of making all parts of locomotives and cars according to standard sizes that shall be interchangeable. I have repeatedly heard it asserted that in the shops of certain roads the practice of making all parts strictly interchangeable was adopted and rigidly followed. For a few years after I began making peregrinations among railroad shops, I kept searching for the place where the different parts of an engine were finished so that they could be applied to any other engine of the same class without fitting, but my quest appeared to be as fruitless as the search of Diogenes for an honest man, and I was much more inclined than the ancient cynic to make small allowances. I found many shops that produce parts so close that very little fitting was necessary, and in the Elevated Railroad shops of New York, when run by Mr. John D. Campbell, I found a thoroughly interchangeable system at work; but Elevated Railroad locomotives scarcely count, and I had given up looking for a surface railroad shop where the ideal work was done. Yet I unexpectedly found what I was looking for on visiting the

BOSTON & MAINE SHOPS.

That establishment is not situated in a place where one would look for an ideal manufacturing shop. It is close to the river at Charlestown, squeezed into a small space by the river and numberless tracks and all sorts of intruding buildings. The shops are designed on the crowd-buildings-on-every-inch-of-ground plan, yet everything within the inclosure is neat, orderly and remarkably clean.

Ascending a runway close to the gate we found the office of Mr. William Smith, superintendent of motive power, who exhibited great courtesy in showing us round (there was a party) and then finished up an interesting visit by the injunction that nothing should be written for the paper about what we had seen. That joke was too funny for a journalist, and I must plead that the necessity for copy is stronger than the injunctions of hospitality.

AN INTERESTING TOOL ROOM.

The motive power office is on a level with the upper floor of the shop where all light work is done, and we first visited this part of the shop. Almost at the entrance we find the tool room and find the place so well equipped with small tools, gauges, jigs, templates and other kindred appliances that we feel like staying there all day. The mechanics running this tool room exert a wider influence in the shop than we have ever seen done in any other place. They not only look after and keep in order all the small tools and instruments of precision used, but they exert a very close control of the cutting tools used on all the machines of the shop. Cutting tools are made to fit as many machine tools as possible and when a workman calls for a tool he gives the number of his lathe or planer and he is supplied from the stock kept ready. Tools are given out on checks that are also used by the workmen on entering the shop gate.

A highly successful effort has been made by those in charge of this tool room to reduce the number of solid wrenches and levers that have to be carried for turning taps, reamers, etc. The heads of all these articles are made of one gauge when the stock will admit of it, and plugs and other articles that have to be moved by solid wrenches are made to one of about three standard sizes.

Systematically arranged tables are kept of the sizes of all material used for tool making and of the exact sizes of such things as drills and the taps that follow them. For instance, the table tells that the steel to be used for lathe tools is of the sizes $1 \times \frac{1}{2}$, $1\frac{1}{4} \times \frac{5}{8}$, $1\frac{1}{2} \times \frac{3}{4}$, and $2\frac{1}{2} \times 1\frac{1}{4}$-inch. Planing machines use tool steel $1\frac{1}{4}$ sq. and $1\frac{1}{2}$ sq. The sizes for all other tools are indicated in the same way. The size and number of threads, and particulars about the drills are given for all taps used in the works.

A REAL INTERCHANGEABLE SYSTEM.

Nearly all parts of locomotives and tenders are fitted to gauges and kept in stock, ready to be put in place. All parts that are most likely to get broken by accident, including cylinders and all connections, are kept in stock, and can be applied without the use of a file or reamer, except in cases like a gland or brass which has to be bored out to fit the rod or pin. But glands and bushes and rod straps and crank pins, rockers, link hangers, eccentrics with their straps, rods and all other parts likely to be called for in a hurry are really made interchangeable. Mr. Smith offered to demonstrate the exact interchangeability of any part we wished to test, but I was satisfied by watching the workmen finishing their work to templates.

MUD PLUGS THAT ARE NOT A NUISANCE.

The want of trifling parts of locomotives often causes vexatious delays that are avoided by the use of an interchangeable system even for parts that have to be frequently removed. On some roads the service of engines is frequently lost for trips through want of mud plugs, and through the confusion of sizes that prevails. Where the maintaining of the sizes of mud plugs is left to the boiler makers, there is generally confusing diversity. A mud plug gets broken belonging to an engine at an out station, and nothing that will fit is at hand, so the foreman telegraphs for a plug, giving the number of threads to the inch. The chances are that when the plug arrives it is too large or too small. The Boston & Maine people have got this mud plug nuisance reduced to a system which eliminates the nuisance part. The same thread of tap is used for all mud plug holes. When the hole is first tapped it is No. 1, and that number is stamped on the plug that fits it. When the thread is worn the hole is enlarged to fit plug No. 2. By following out this system a foreman knows by the number on the plugs of his engines what sizes to keep in stock. All other plugs about the boiler are maintained in the same way.

CABS AND PILOTS MADE TO CHANGE EASY.

The interchangeable system has been extended to cabs, pilots, bumper beams, head light brackets and boards, bell brackets and to all the parts of engines and tender trucks. Only two sizes of engine cab are used and these two cabs are built of interchangeable pieces made by special processes. The workmanship on a cab costs 65 cents. There is only one size of pilot. It fits all the locomotives belonging to the company.

"A PLACE FOR EVERYTHING," NOT NECESSARILY A SCRAP HEAP.

The shop contains first-class tools, and they are well arranged for doing the work; but an old round house is made to do duty as an erecting shop, and in spite of the exercise of much ingenuity, the inherent inconvenience of the place cannot be altogether overcome. With all its disadvantages the shop is particularly clean and orderly. There seems to be a place for everything and everything is in its place. In different parts of the shop are to be found neat cylindrical cast iron boxes set on end. They are for holding greasy waste and they are covered by a flap lid which cannot be left open. If every shop was provided with these boxes and the men trained to deposit all greasy waste therein, there would be fewer mysterious fires burning down machine shops. The overhead trolleys of the kind that have been copied from packing houses are used in this shop to good advantage, all the machine tools being reached by trolleys or swing cranes.

A COLOR TEST FOR IRON AND STEEL.

There is a practice followed here with the store house iron rack that is well worthy of imitation. The end of the rods are all painted a color which denotes the kind of iron; Burden is lead color, lowmoor yellow, Norway red, refined white, tool steel brown, machine steel blue, Taylor iron green. Green was chosen for this iron because a certain master mechanic of that name was noted for painting his locomotives green.

MIND MAKES THE MILL GO ROUND.

Mr. Smith is an exceedingly able and systematic head of the motive power department, and he is the kind of man that would have no loose practices in the shop under his management, but an important part of his success comes from his judgment in selecting good assistants. Mr. E. E. Davis, master mechanic, immediately in charge of the shop, deserves much credit for the condition of the place. He is aided by as fine a set of foremen as can be found anywhere. With 165 men this shop does all the manufacturing for 450 hard worked locomotives, and does no end of other work besides.

Old Colony Railroad Shops.

NEW MOGUL LOCOMOTIVES.

There have been lately turned out of the Old Colony Railroad shops at Boston some fine mogul locomotives designed by Mr. Lauder for heavy fast freight service. They are throughout as finely proportioned engines as any we have ever examined, and are suitable either for freight or heavy passenger trains. The cylinders are 19×24 inches and the driving wheels 57 inches diameter. The boiler is 56 inches diameter at the smallest ring, is of the wagon top form and is made to carry a working pressure of 160 pounds. The American equalized brake is used for the drivers, and all the latest improvements have been applied to the engines.

ENGINEERS ON THE LEFT HAND SIDE.

A new eight-wheel fast passenger engine has lately been built. This engine is the same in every respect as the other standard passenger engines, except that the engineer is placed on the left hand side and all the appliances for handling the engine are put to that side. This is done to give the engineer a better opportunity to observe station signals. The trains on the Old Colony are run on the left hand side and it is found that an engineer sitting on the right hand side of the engine is often at a disadvantage in watching signals. As there are already interlocking switches and signals at 13 points on the main line it is important that the engineer should be in the best position for watching them and for this reason the change has been made. When the practice of running on the left hand track was introduced, it was supposed that an advantage would be found from the engineer being on the right hand side, as he would have an unobstructed view of passing trains, but the general introduction of signals alters the case and makes it desirable that the engineer be on the same side as the signals are.

THE COMPOUND LOCOMOTIVE.

Most of our readers are aware that Mr. Lauder, of the Old Colony, is building a compound locomotive on designs furnished by Mr. F. W. Dean. The engine has been under way for a long time, the delay having arisen principally through their having to wait for the casting of the cylinders. These parts of the engine were in the machine shop during our visit there, and very creditable castings they are. The low pressure cylinder has a steam jacket cast round the inside body, which made an exceedingly complex casting. As there is difficulty in providing reliable means of drawing the moisture and condensed steam out of the jacket of a locomotive cylinder it is not decided to a certainty that steam will be used, but Mr. Lauder feels sure that the space will be an advantage even if it is only filled with air. We would suggest that he provide means for making a portion of the smoke box gases pass through the jacket cavity.

The boiler for the compound locomotive is well worthy of examination. The shell of boiler and fire box is of $\frac{1}{2}$-inch Otis steel. One sheet makes the whole of the fire box shell, so that there is no longitudinal seam in that part. The connecting sheet between the wagon top and the barrel of the boiler is the frustum of a cone made from a single sheet. This connects with another single sheet which forms the barrel of the boiler and reaches to the front flue sheet and smoke box. The boiler is 56 inches diameter at the smallest ring, and is designed to carry a working pressure of 200 pounds to the square inch. The foundation ring is double-riveted, and the outside and inside sheets of the fire-box are bound together by good iron stay bolts 1 inch thick.

NUMEROUS PASSENGER CARS FOR A SHORT ROAD.

The car department is extremely busy mostly in repairs, the heavy passenger service of the past season having left a great deal of work to be done, but every passenger car that could carry people had to be kept busy. They have nearly 600 passenger train cars which represents the capacity for handling a big volume of business on the short lines operated. All the passenger cars belonging to this road have platform gates, which is a valuable means of preventing accidents. There is one vestibule train run between New York and Boston but New England roads have not adopted that form of luxury to a great extent. Nearly all the passenger cars belonging to this road have quick acting air brake valves.

Chicago, Rock Island & Pacific Shops.

During a recent trip over the Chicago, Rock Island & Pacific I found that the rolling stock was looking remarkably well, although the road had been performing an abnormally large business, which taxed particularly hard the endurance of the motive power. A few days after returning from a round trip to Omaha I found, on visiting the shops at Chicago, that Mr. Geo. F. Wilson was feeling master of the situation, so far as keeping up the work was concerned, and that besides maintaining repairs up to the mark he had three or four new engines in the shop, some of them nearly finished. On examining these engines I found that some of the old-time practices, for which this road had been noted, were abandoned. The short steam port has been very considerably lengthened out, the throttle valve has been placed in the dome, and the engines are finished as if they had come from the hands of mechanics.

The new eight-wheel passenger engine that Mr. Wilson is building is a very sensible looking locomotive, and one that will give very useful service either on passenger or freight trains. The cylinders are 18×24 inches and the driving wheel centers are 62 inches diameter. The details of the engine appear to have been worked out with uncommon care and skill. While the parts are sufficiently strong for the strains and stresses of service, little superfluous material is carried, and there is an absence of the prevailing practice of weighting down. The valves have $\frac{1}{4}$-inch outside lap, and have a full travel $5\frac{1}{2}$ inches, that being the same as the throw of the eccentrics. The driving axle journals are $7\frac{1}{2} \times 8$ inches, the engine truck axles are $5\frac{7}{8} \times 8\frac{1}{2}$ inches, the main rod pins have a bearing $4\frac{3}{4} \times 5\frac{1}{2}$, and the side rod pins are $4 \times 3\frac{3}{4}$ inches. These particulars show that care has been taken to provide ample

bearing surfaces for the parts most likely to cause annoyance by heating.

Boies steel tired wheels are used in engine and tender trucks.

The boiler is of the wagon-top form, made of ½-inch steel throughout. The diameter at the smallest ring is 56 inches. The firebox is 75½ inches long inside, and goes down between the frames. There are 220 flues, 2 inches diameter and 11 feet 7¼ inches long. The boiler and firebox give a total heating surface of 1,482 square feet.

PROGRESSIVE BLACKSMITH.

There is nothing materially different in the machine shops since I visited them last, but there has been something resembling a revolution in the blacksmith shop belonging to these works. The blacksmith shop is generally about the last part of a mechanical establishment that puts itself in the progressive line, and the Rock Island shop went on for many years with the comfortable assurance that the methods of the fathers were good enough for the sons, and that a railroad company had no right to hurry men out of their long accustomed slow gait. The choice was for doing all forging by the slowest processes, and the foreman despised the use of formers and similar appliances that tended to reduce the work of the skillful blacksmith. Mr. Wilson desired to see the blacksmith shop run after advanced ideas and another foreman took charge. The men readily fell into line, as they always do when they are wisely led and within a few short months the shop has adopted methods that increase the production many fold, the men are better paid for their labor and the company is getting the work done in quantity that keeps pace with the requirements of business. By means of a good heating furnace, a powerful bulldozer and a multitude of well designed formers they turn out an immense quantity of simple forgings at small cost, the kind of parts that are most common in locomotive and car construction or repairs. The furnace is the Zellweger gas furnace which generates water gas from common Illinois coal and requires very little attention. The gas is supplied to a reverberatory furnace with an ample hearth for the heating of the iron. Any company thinking of supplying themselves with a good heating furnace should look into the merits of this one. To the foreman, Mr. George Tukbury, great credit is due for the devising of formers and for his executive ability in running the shop on an orderly basis. To give an idea of what the past and present of this shop have been it may be mentioned that with the furnace, bulldozer and formers four men make 450 Janney drawbar yokes in nine hours. When they worked by hand four men made 50 of the yokes in ten hours. They used to have a couple of fires working on Janney coupler lifters and the demand was always behind the supply. The lifters are now made on the bulldozer in odd times when nothing else is pressing and the supply is always ample. So many pieces that were formerly made by regular blacksmiths are now turned out by aid of formers, that the ordinary fire have time for all real blacksmith work, and the delays formerly caused by waiting for forgings are now unknown. This, of course, facilitates production all around.

There are a great many superintendents of railroad shops that would do well to reform their blacksmith shop on the basis worked out in that belonging to the Chicago, Rock Island & Pacific. It cannot, however, be done by issuing an order to the foreman that he must change his ways. The man urging forward the reform must be a manager of men, besides having discrimination to select capable assistants. A. S

Railroad Business Principles.

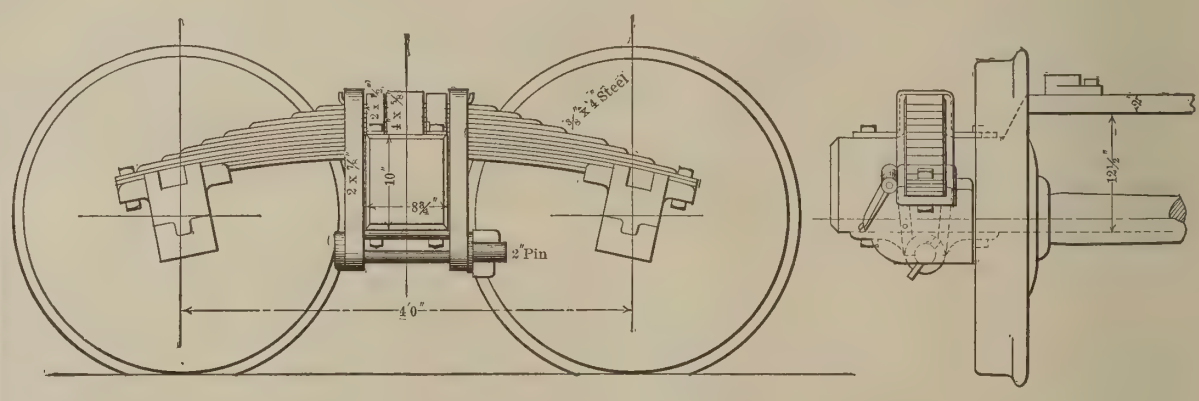
Iron and steel manufacturers have special reason to find serious fault with the business principles of railroad managers. No other business is so highly favored with cash receipts as is the railroad interest, while on the other hand the extreme limit of credit is taken in purchasing supplies or material. A ticket agent would smile with supercilious disdain if asked to sell a ticket on time, and even checks are valueless over ticket agents' counters. Very hard cash is required. Freight bills are usually paid before the freight passes from the control of the railroad companies, and an accommodating agent who departs from this rule makes himself personally liable for the amount involved. The railroad companies take no risk in the collection of debts for freight. In the case of a disputed claim they hold the cash, and the shipper makes up the case. If they sell old material they are known to even go so far as to make their terms "sight draft against bill of lading." But when they become purchasers the whole system changes. No longer is such a matter as "cash" known. Paper is given when it is absolutely necessary, but paper is almost as sparingly dealt in as cash. Railroads prefer open accounts which have an agreeable elasticity as to times of payment.

This peculiar policy of the railroad companies has done more to aggravate the financial squeeze in the West than any other single cause arising from a domestic source. As soon as a financial stringency developed, the railroad companies apparently instituted measures to defer payments for supplies purchased. Some of the largest corporations in the country endeavored to pay for steel rails in time paper instead of in cash, as they had contracted. Car builders found themselves embarrassed for funds by the professed inability of their customers to secure the cash needed to meet their immediate obligations, and these customers were prominent railroad companies whose revenues were almost wholly cash and who do not keep open accounts with any of their patrons. There was no abrupt falling off in railroad business to cause a shrinkage in receipts, nor was there a war of rates to diminish revenues, but on the contrary, every road was choked with traffic and the car famine had not been relieved.

What was the cause of this peculiar attitude of the railroad companies? The facts are hard to get at, but a little light can be thrown on the subject. It is known that some of the leading corporations have for a long time been in the habit of making loans on call in the financial centers. A tight money market with high rates of interest offers inducements for the use of cash which are much more persuasive than the appeals of the sellers of railroad supplies. Even if legal interest should accrue on bills past due, a good profit would be realized, because of the much higher rate paid by borrowers. How far this practice extends among railroad companies it is, of course, difficult to ascertain, but that it is quite common among them is not entirely a matter of conjecture. So far as it is pursued to the convenience of the creditors of the railroad companies, it is an abuse which should be corrected. It is unjust to manufacturers of iron, steel and railroad supplies that their capital should thus be used without their consent as a basis of speculation in the financial marts.

There are railroad companies whose managers presumed upon their high standing in demanding credit for materials purchased. Because their bonds are gilt edged securities and their stock has a steady market value these managers sometimes go so far as to exceed all well-established customs in ignoring bills rendered for materials furnished. It is well known that one great corporation carried this practice to such an extremity for several years that manufacturers generally declined to make bids on supplies needed, and the managers of that corporation found themselves obliged, much to their disgust, to adopt regular monthly periods of settlement, just like the common herd of business people. In one of the largest railroad centers of the country it is the experience of manufacturers that only one railroad company out of a score can be depended upon for a regular monthly settlement. All the others pay as they please, whether times are good or bad, and whether railroad traffic is heavy or light.

The business ethics of these corporations evidently need radical reformation. If they conducted a credit business in hauling freight and passengers there might be some excuse for an occasional laxity in paying for their supplies. But as they insist upon spot cash from the public for all services rendered, they should, at least, have monthly periods for settling accounts with those from whom they purchase. Monthly settlements would give plenty of time for the examination of vouchers, the adjustment of claims for allowances, and the collection of funds to meet the obligations. It is a blot upon railroad management that the present system of looseness should prevail. Manufacturers are justified in demanding that it be changed.—*Iron Age.*



Curious Car Truck.

A railroad man familiar with the use of the truck illustrated in the annexed engraving, writes about it as follows:

This truck is used quite extensively on the Georgia Railroad and as the question of bracing trucks to keep them square comes up frequently in conventions and club meetings, the cut may be of interest to railroad men who have not seen this one. The experience of those who have had an opportunity to see this truck in service, and to watch the item of repairs, will bear out the fact that it is perfectly safe in service, and economical to keep up. These trucks are used under cars having less than 30,000 lbs. capacity.

The Georgia Railroad has probably 200 cars with this style of truck under them.

Their later cars have a more modern truck, but presume the change is made more on account of the common custom than through any fear of the old truck not being safe. It will be noticed that the truck illustrated is composed of but eighteen pieces, not counting the wheels and axles, brasses, boxes, side bearings, and center plates that are common to all trucks, and omitting the few bolts and keys shown in the cut.

Driving Wheel Brakes.

At the November meeting of the New England Railroad Club Mr. L. M. Butler read a paper on "The Best Form and Application of Brake for the Driving Wheels of Locomotives." He made some comments on the different forms of driver brakes in use, and denominated the Westinghouse a rigid brake and the Eames vacuum an elastic brake. He dwelt on the necessity for strong mechanism for driver brakes that would not break and cause accidents. Strong objections were urged against steam brakes of any form. The leakage of water on the rails was a most objectionable thing, and all steam brakes dropped water. The ordinary objections to the spread brake were stated. In his own experience Mr. Butler did not find any evil effects from the action of the brake forcing the wheels apart. For several reasons he preferred this form of brake for eight-wheel engines. On moguls and consolidation engines he preferred putting a shoe in front of each wheel.

Mr. James Howard, of the Beals Brake Company, read a paper on brakes in which he took strong grounds in favor of applying brakes to all the wheels of engine and train. In regard to the form that is best for driving wheels, he preferred the Beals brake, operated by steam.

Mr. L. R. Pomeroy believed that theoretically it was best for the driver brake to clasp the wheel, but he admitted that in the interests of simplicity theory had to be sacrificed. Thought that the 284 parts of a Beals brake brought in an element of danger from the parts breaking and falling on the track:

Mr. J. N. Lauder understood that many railroad men had been conservative about applying brakes to driving wheels. He had been slow to adopt these brakes, but he was now convinced that they were a necessity and that they ought to be operated along with the train brake. His experience had been that when driver wheels were used only as emergency brakes, they were not used at the time they were most wanted.

Mr. Parke, of the Westinghouse Air Brake Company, contended that the theories respecting the superiority of the clasp brake over the single shoe brake were erroneous. An objection usually urged against the application of a brake between the wheels was that the forcing action damaged the axle boxes, wedges and brasses. The boxes, wedges and brasses have to be made sufficiently strong to withstand the pulls and thrusts transmitted from the main steam cylinders, which are much greater than the power transmitted through the brake shoes. The power from the cylinders is applied all day long, and when no damage results from that there is small likelihood of damage being caused by the lighter brake power being applied at long intervals for a short time.

Mr. Angus Sinclair had not found in practical working that the use of brake shoes between the wheels did any damage to connections. Had found while using a driving wheel brake that when applied on a long grade it would loosen the tires, but thought that when tires were thin enough for that that they ought to be changed. Did not believe in emergency brakes, because when the emergency came an engineer would only go through the motions he was accustomed to perform. Had found that driver brakes on locomotives made freight brakemen careless.

Mr. F. D. Adams agreed with Mr. Sinclair that the use of driving brakes demoralized brakemen. Had noticed that in switching brakemen depended on the engine doing all the braking, and from this cause cars were often smashed together.

The subject for next meeting will be "What constitutes a defect in the vertical-face coupler sufficient to condemn the coupler?"

Joint Car Inspection in the South.

At a meeting of the Southwestern Railway Club, Mr. J. J. Casey, Louisville, New Orleans & Texas Railway read a paper on "joint car inspection." He described the various plans of joint car inspection in use The first system is where all the roads in a railroad center employ one inspector who is not responsible to any one road. It is his duty to place a sufficient number of inspectors at the different points of interchange to inspect all freight cars arriving and being delivered to connecting roads. Cars with defects are switched out and placed on repair tracks. Should any cars be damaged in such a manner that they cannot be repaired without unloading, they are ordered to be transferred at the expense of the delivering road. Where this plan is in vogue it is customary to change inspectors periodically from one yard to another in order to prevent injustice and favoritism. These inspectors are not required to do any other than interchange work.

In the second system each road employs its own inspectors but places them in charge of one joint car inspector, who is to have control over them in so much only as pertains to inspecting cars for interchange. Like in the first plan cars with defects are placed on a repair track, and such cars as are unfit for service are transferred at the expense of the delivering road. Unlike the first plan, these inspectors cannot be changed from yard to yard, but remain permanently in the yard of the company employing them.

By the third system each road employs its own inspectors, and depends upon them to protect their interests. These

inspectors are subject to the car foreman who employs them, the joint inpector being employed only to decide disputes that arise between the inspectors of the receiving and delivering roads.

In the first and second systems the joint car inspector issues all defect and transfer cards. In the last named he issues only cards covering such defects on cars transferred as are in dispute and which he is called upon to arbitrate.

The roads entering Memphis have a system of joint inspection similar to the last named. It works very well, and is quite an improvement on what is known as straight inspection. The joint car inspector is employed by the Superintendents' Association. It would, in my opinion, work better if the appointment of the joint car inspector was transferred to the heads of car departments. The latter should meet at least once a month and review the work done by the joint car inspector, and if his rulings are not right he could be corrected and a repetition of them prevented. There is no branch of railroad service that requires more intelligent supervision than this, and it should be vested in those whose duty it is to familiarize themselves with the details of the work. It is reasonable to suppose that by the change suggested in the manner of appointment, more competent men would be selected for joint inspectors.

I think I am safe in saying that as far as delays to freight is concerned, any of the other systems mentioned will decrease them fully one-half, if not two-thirds. This being the case, it would seem to be the duty of those in charge of car departments to put a system of joint inspection in force at all interchange points. The details can be arranged to suit the locality.

Mr. Cullen said they used No. 3 system, and it worked satisfactorily.

Mr. Meehan said that No. 3 system was in use at Cincinnati, and it works well, but he did not think the joint inspector had sufficient authority. He favored the local inspectors being compelled to accept interpretations of the M. C. B. rules as made by the joint inspector.

Mr. Casey found that where joint inspectors were employed by superintendents they were inclined to disregard M. C. B. rules.

Mr. Leeds said that the joint inspection at Louisville is controlled by the mechanical department, and he knew of no better system. They hold the joint inspector rigidly to the M. C. B. rules of interchange.

Brake Rigging.

At the December meeting of the New York Railroad Club Mr. Parke, of the Westinghouse Air Brake Company, read a paper on "Brake Rigging." He treated the subject under three heads:

First—The character of the apparatus.

Second—The care given to its maintenance.

Third—The manner in which it is handled.

The author went into detailed particulars under the first heading to show that in numerous cases the efficiency of the air brake was materially reduced by the use of weak and badly designed appliances for transmitting the power from the brake cylinders to the wheels. Accidents are frequently due to this defect. He commended the system of brake rigging adopted by the Master Car Builders' Association, and said that it is giving results that leave little to be desired. The weak wooden brake beam in common use was shown to be dangerously defective, for its want of stiffness often prevents the power from being applied. The trussed wooden beam was shown to be little better than the other. In many instances the piston travel due to weak apparatus alone exceeds half the stroke of the piston, and as a result the piston travels the half or nearly the full stroke in taking up slack alone. This leaves very small margin for wear of shoe before the piston strikes the cylinder head and fails to apply the brake.

To illustrate the futility of trying to stiffen wooden beams by trusses or iron plates, the results were given of a carefully conducted experiment with what would be considered a well trussed beam. It was found that a piston movement of 3⅝ inches was necessary to compensate for the spring of the four brake beams under an ordinary car. A deflection of this extent, says the author, occurring with a beam supposed to be amply strengthened, will suggest what may be expected from the ordinary untrussed wooden beam.

Particulars were given of various accidents that happened which would have been avoided had the brakes been applied in proper proportion to the weight of the train. In some cases these accidents resulted in loss of life. The leading causes of braking inefficiency are defective rigging, the absence of brakes on locomotive drivers, and on the middle wheels of six-wheel trucks. During this year a disaster occurred by a collision at a railroad crossing, resulting in loss of life, and the braking power was found to be only 24 per cent. of the train weight. In a tail end collision several persons were killed, and the braking power was found to be 49 per cent. of the train weight. In another case a passenger train was flagged upon a descending grade of 80 feet to the mile, 2,000 feet in the rear of a freight train, but a collision happened. The braking power, supposed to be available, was 44 per cent. of the train weight, but some of the brake pistons were at the end of their travel, and this passenger train might have run to the foot of the grade, with the brakes applied, if the freight train had not been there to stop it; in this unconventional manner such things are done.

Many other cases of similar character might have been given, but these were supposed to be sufficient to illustrate the gravity of the case when a majority of all the passenger trains running in the United States to-day through defects of braking apparatus run from 25 to 75 per cent. farther before they can be stopped than they ought to go.

Where the proper mechanism is provided for applying the full braking power to the wheels, accidents frequently happen owing to carelessness in taking up the slack. The engineer of a passenger train struck a wagon on a crossing, and feeling that he applied the brakes in ample time to stop he went back and examined the brakes. The discovery was made that most of the brake pistons were resting against the cylinder heads. Some railroad officers think that when once a brake is applied it ought to require no more attention. A case was cited where a master mechanic requested the brake company to find out what was the matter with the brakes on his road, as they were not working satisfactorily. They had been in use for nine years and had never been touched, never oiled or examined. He seemed to think that apparatus left so severely alone was behaving ungratefully when it began to be balky.

The true inwardness of the reported "failure of air brakes," as recorded in the press dispatches, was illustrated by an accident that happened on the Erie lately. The air pipe cock at the back of the tender had been accidentally broken off at the round house, and the engineer plugged the pipe and went out with the train. When another train was perceived standing on the main track the air brake failed to work, and the ubiquitous reporter did not fail to put the blame upon the apparatus.

It is found that with the new quick acting brake, unskillfulness in handling is much more apparent than with the slower acting mechanism. There is much difficulty in getting the engineers on some roads to handle the brakes with care, intelligence and skill.

We regret that we are unable, through limited space, to give this admirable paper in full.

Best Locomotives for Heavy Trains.

At the Nashville meeting of the Southern Railway Club, Mr. James Meehan introduced a discussion on "Types of locomotives best suited for heavy passenger and freight service; relative economy and safety of ten-wheeled and mogul engines."

Mr. Meehan preferred eight-wheel engines when the cylinders did not exceed 18 inches diameter, but for larger powers he favored ten-wheeled engines for passenger service and moguls or consolidations for freight. Believed that a consolidation engine ought to have cylinders 20 inches diameter and a weight of 127,000 pounds. Had found ten-wheel engines most economical for heavy passenger service, but could not run them with flangeless drivers in front as the wheels dropped off the rails on their sharp curves.

Mr. P. Leeds preferred eight-wheel engines when the weight did not exceed 97,000 pounds. When need for a large boiler raised the weight to 115,000 pounds, he preferred a ten-wheeler, even when the cylinders were made 20 inches diameter, for a weight of 90,000 pounds on the drivers, would be sufficient for adhesion with 62-inch driving wheels. For heavy freight he preferred a consolidation engine, but he considered a mogul perfectly safe for any service. Did not believe in putting 66 inch wheels under engines with 20 inch cylinder and a total weight of 130,000 pounds, because the weight could not be utilized for adhesion and the engine was weak in climbing hills. For a 19-inch cylinder, would not use a wheel larger than 62 inches and preferred 60 inches.

Mr. Cullen understood that on the East Tennessee, Virginia & Georgia ten-wheelers had proved to be one or two cars better than moguls of the same general dimensions.

Several members spoke of the brick arch, and it was considered a valuable fuel-saving device, in both deep and shallow fire boxes.

In a Russian Sleeping Car.

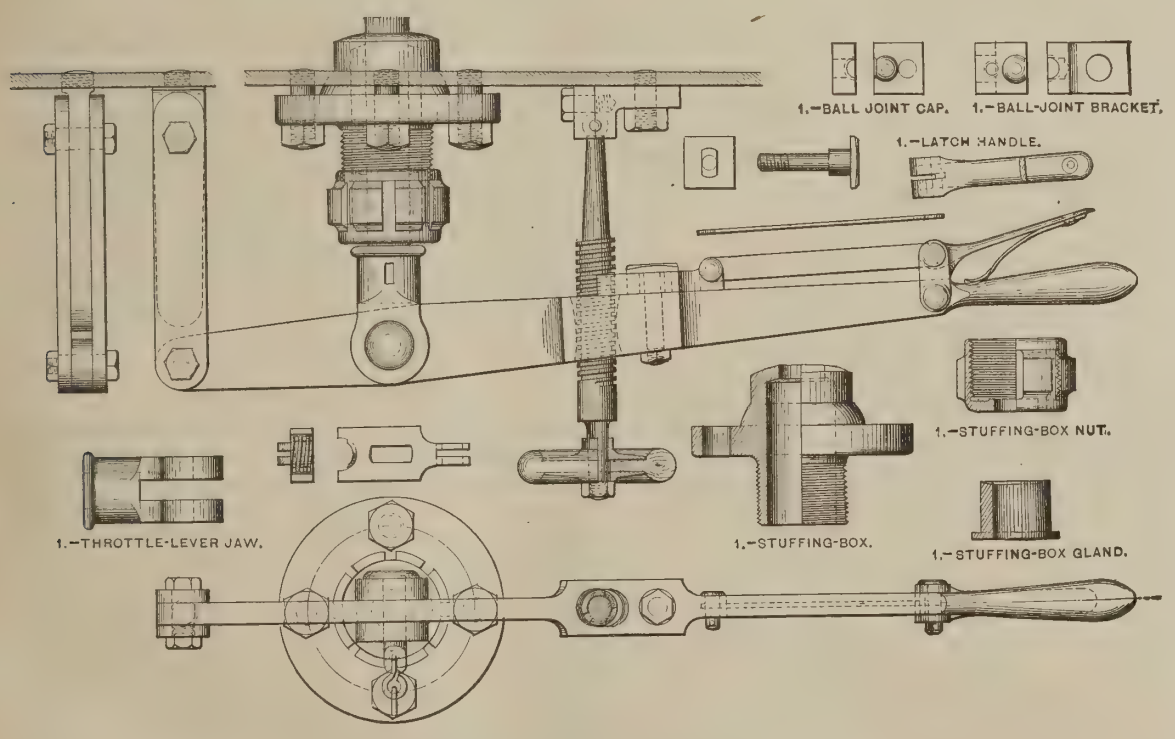
The following is an extract from a letter that appeared in the Philadelphia *Ledger* from a traveler giving an account of his experiences on a Russian railroad:

You must furnish your own bed clothing, pillows, wraps, towels, etc., and as all travelers in Russia, as a general thing, have them, you are not much incommoded, except at times, when you cannot undress. The great trouble is from the unusual amount of bundles and traps of all sorts that passengers are permitted to take into the cars with them, oftentimes thereby infringing upon the rights of others in the occupying of all the racks and most of the desirable seats, especially so when often upon trains of from 10 to 12 passenger cars there is no more than one-half of a car allotted to first-class passengers. The first-class half is painted blue outside and numbered, and the other half drab, also numbered as to class. You are also annoyed at the clouds of cigarette smoke, caused by the universal habit of smoking in the cars, at table, and almost everywhere else. There are no smoking rooms, not even in the hotels. Women, without regard to rank, all join in. Travel is generally by second class; the peasants by the third, with very little difference, except in fare, between the first and second class. In the first you have more elbow room and freedom from bundles. Should you be lucky enough, as we were, to secure ahead the exclusive use of a compartment, you can be very comfortable indeed.

Car Couplers in Michigan.

The Commissioner of Railroads of Michigan sent out a circular to railroad managers intimating that it was not practical to enforce the law requiring all cars to be equipped with safety couplers by the first of the year, and suggesting that it might be sufficient if the foreign cars having used woods above and below the draw heads were so equipped. These cars are particularly dangerous to the men who have to couple them. The railroad managers made answer that considerable hardships would result to shippers if cars of this character were excluded from the State, and the belief was expressed that the danger from this class of cars is overestimated. The trainmen, on the other hand, regardless of the branch of train service in which they are employed, or the company employing them, are universally of the opinion that the cars are unusually dangerous, and that their use, unless equipped with automatic couplers, should be prohibited.

The Railroad Commissioner has again issued a circular letter to railroad men, in which he says he will recommend that the law be so amended as to extend the time for equipping the freight cars with safety couplers for three years, but that all new cars and cars of certain dimensions taken to the shop for repair, shall be equipped with the approved safety coupler. The commendable effort and progress manifested by most of the leading companies in complying with the law is shown by the number of cars each company has thus equipped. The number of men daily killed or injured in coupling cars is so great that it is believed that regard for humanity requires that every possible effort should be made to do away with the cause of such accidents.



New Throttle Lever for Locomotives.

A description of this arrangement is superfluous to those familiar with the requirements of this important detail of locomotive construction, as a glance at the drawings will clearly show its construction and operation, and will convince the engineer that all the requirements of a most effective throttle regulator are fulfilled.

While this mechanism permits of the nicest regulation of speed as at starting a train and in switching, it also affords most rigid position and positive action of the lever without sacrificing any desirable feature of the ordinary toothed latch in its quick action in opening or closing.

The design of the stuffing box, although not a novelty in its application to similar purposes, is nevertheless a great improvement on the old-fashioned gland as ordinarily adjusted by studs screwed into the stuffing box so universally used on locomotives.

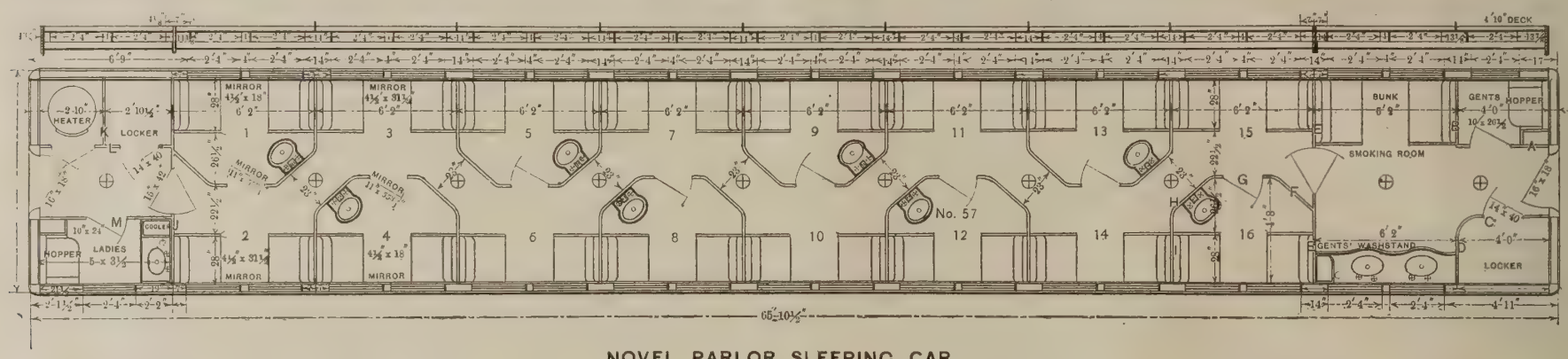
A very important feature is the extension of the fulcrum tongue, which, being screwed into the boiler head, extends back as near as possible to the fulcrum of the lever, thus making this a fixed point vertically, and dispensing with the lever guide or rest ordinarily employed.

This throttle lever is the latest standard of the old reliable Mobile & Ohio Railroad.

It is the invention of Mr. L. J. Morris, road foreman of engineers, and he hereby dedicates it to public use, hoping that it will prove as satisfactory on other roads.

Novel Parlor Sleeping Car.

The annexed engraving shows the floor plan of a peculiar form of parlor single-berth sleeping car designed by Mr. E. G. Allen, superintendent of the New York Central, and lately introduced by the Wagner Palace Car Company, on trains between New York and Boston. The general arrangement of the car will be readily understood from an examination of the engraving. It will be seen that eight state-rooms are provided, which each provide sitting or sleeping accommodation for two persons, while there are nine open rooms that have each the same capacity as the close state-rooms. This novel arrangement will enable travelers who wish to have greater privacy than what the ordinary sleeper or parlor coach affords have what they desire. It is finished in satinwood and is very elaborately ornamented. The state-rooms are fitted with two sleeping berths each, an upper and a lower, and each berth will hold but one person. The sections have but one berth, and this for one occupant only. Each car will, therefore, accommodate 24 passengers. Each state-room is fitted with a lavatory and hot and cold running water. The trucks have 30-inch steel wheels. The New York Safety system of steam heating is used in connection with the Baker heater, and the cars are supplied with hot and cold water, and lighted with Pintsch gas. The lavatories are supplied with automatic house closets. The head lining is of three-ply veneer covered with canvas, and has richly carved relief ornamentations in soft steel gray and gold tints. The plush used in the upholstery is a blue fringe. The draperies are of silk, lined with damask, and the trimmings are of Persian brass. The decoration is of the Roman renaissance, or eighteenth century style.



NOVEL PARLOR SLEEPING CAR.

C., R. I. & P. Car Shop Notes.

At the Chicago, Rock Island & Pacific shops work has been very busy this fall. In the freight yard they have wrought ten hours up to the end of November and often over-time. No new work has been done for some time, as all hands were needed on repairs.

But now this month things are quieter and the hours are shortened up to eight. Yet to those around the shops it looks as if it must be a matter of policy, for they can see no necessity for doing so, as the shops are full of work. Every track in both paint and coach shops is occupied.

Blacksmith and engine shops are also crowded with work. In the coach shop they are remodeling two sleeping cars, putting in high-backed seats and upholstered paneling, and all the latest improvements. When these cars are finished they will be as handsome and comfortable cars as can be seen anywhere. They are also building two mail and express cars, fitted up with Harrison's patent mail racks, and every arrangement possible for the quick and easy handling of mail matter. Among the first days of last month the last of three high-class day coaches left the shops. It measured 54 feet 6 inches over sills and 10 feet wide. The interior finish is of mahogany, plain yet very artistic. There is a gentlemen's toilet at one end and a ladies' room at the other.

It is fitted with the Scarritt high-back reclining seats; there are mirrors on the cross partitions which give a bright and nice effect to the car, it is heated with the Sewall steam system, and has the Jenny-Millar combination platform, so that it could be easily changed to a vestibule if desired. It is set on four-wheeled trucks, with 36-inch Fowler cast steel wheels, and has collarless journal with end stop.

Performance of Rhode Island Compound Locomotive.

The Rhode Island Locomotive Works have issued a statement giving particulars of the performance of the compound locomotive built by them for the Brooklyn Union Elevated Railroad. The results are substantially the same as the particulars published respecting the engine in the November and December issues of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

A series of tests were made under the supervision of Mr. C. H. Batchellor, chief draughtsman of the Rhode Island Locomotive Works. Indicator diagrams taken from the engine and the record of coal and water used make up the statement sent out for the information of those interested in compound locomotives.

The results obtained by the compound, working in the same service as the best simple engine on the road, is a saving of fuel of 37.7 per cent. and a saving of water of 23.8 per cent. This was for one day.

Rolling Bolts and Threads.

At Fitchburg, Mass., there is a manufacturing establishment called the Simonds Rolling Machine Works, which no man interested in curious mechanical processes, who happens to be in the neighborhood, should fail to see. Our attention was directed to the place through being told that the proprietors had peculiar methods of forging articles by rolling, and that their process was particularly well adapted for the manufacture of bolts, rollers, balls, screws and articles having fillets, collars or parts of unequal diameter.

On visiting the works, where we were kindly treated by the men in charge, we found that the rolling work was nearly all done between flat bars working vertically and having the form cut into or raised upon the face. Quite a large business is done in making track bolts by the process, the head and threads being rolled hot. They have worked out the process of rolling threads with great nicety, and continue to make as clean and accurate a thread as if it was cut, and of course it is much stronger than if it were cut. It appears to us that there are a great many articles used in car construction that might be made to advantage by this process. They are making the pins for standard brake rigging and finish them almost as accurately as if they were turned in a lathe. This rolling process is much better adapted for doing accurate work than any other, for the thickness of any article is regulated by the distance the movable bars are kept apart, and this distance can be regulated as closely as ordinary callipers can be set. It is said that the threads of the rolled track bolts are so strong that they cannot be stripped by using an ordinary track wrench. It would be a good process for the making of follower bolts, cylinder head studs, steam chest bolts and all other kinds of bolts and studs that are frequently broken by the tightening of nuts, causing much delay and inconvenience.

They make immense quantities of iron balls that are used principally in anti-friction bearings. Shafting run on these bearings is said to require very little attention.

Air Brake Standards and Instructions.

The committee of the Master Car Builders' Association, consisting of John S. Lentz, W. F. Turreff, and N. W. Sample, appointed to investigate the above subject, have issued the following circular:

How many freight equipment cars have you equipped with M. C. B. standard air brake details, *practically* like those shown in Plate X, proceedings 1890?

How many of the same cars are equipped with iron brake beams?

How many freight equipment cars have you equipped with iron brake beams, and with brake details different from those above mentioned?

Do you think that good results can be had and maintained by any form of wooden brake beam with modern air brake equipment, or do you consider that iron brake beams are necessary for good results and economy?

Representative members are requested to reply to above questions to John S. Lentz, Chairman of Committee, at Packerton, Pa., before Jan. 1, 1891.

Southern Railway Club.

The Southern and Southwestern Railway Club, which was formed during the time of the conventions at Old Point, has been holding peripatetic meetings at points most convenient for the members who hail from all parts of the South. The officers of the club are, president, E. S. Marshall, St. Louis, Arkansas & Texas; first vice-president, Wm. Garstang, Chesapeake & Ohio; second vice-president, J. J. Casey, Louisville, New Orleans & Texas; secretary, W. H. Marshall, *Railway Review;* treasurer, S. G. Scarritt, St. Louis. Up to time of writing, two meetings of the club have been held, one at St. Louis and one at Nashville. Next meeting will be held at Atlanta on Jan. 15.

The first meeting was devoted to discussing details of organization. At the Nashville meeting several live current subjects were discussed. Mr. James Meehan led off with remarks on the "types of heavy locomotives best suited for heavy passenger and freight service," and it led to a good discussion. After that was finished Mr. J. J. Casey read a valuable paper on "joint car inspection," which was also exhaustively discussed.

"Rigid and swing-beam trucks" will be the first subject discussed at the Atlanta meeting, to be followed up by one on "Relative merits of brakes hung to the body of the car and those hung to the trucks."

Place of Meeting for Conventions.

Mr. John W. Cloud, Secretary of the Master Car Builders' Association, has issued the following circular:

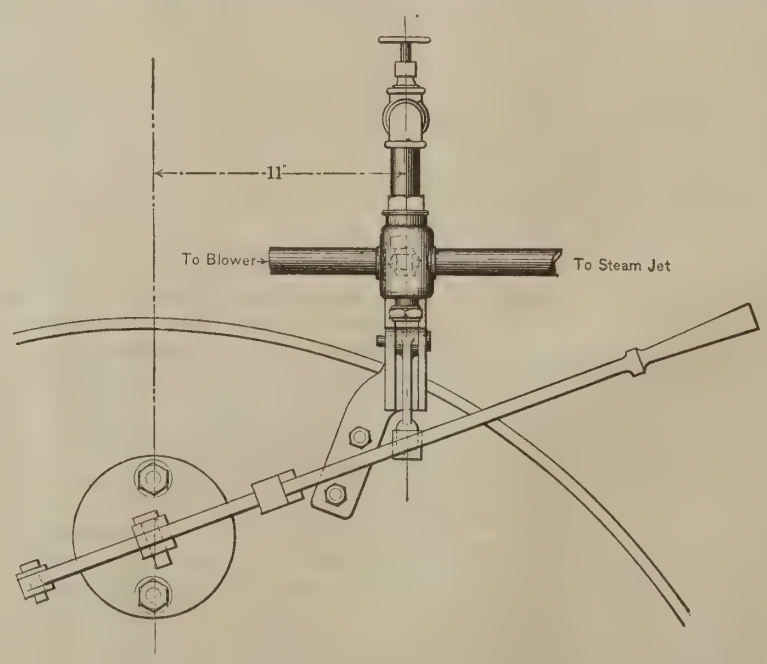
"In accordance with their duties as prescribed by the constitution, the Executive Committee announces that the next Annual Convention well be held at Cape May, N. J., commencing Tuesday, June 9, 1891, at 10 A. M.

"Headquarters will be at Stockton Hotel, which has made a uniform rate of $3.00 per day. Messrs. Blackall, Lentz and Kells are appointed as a committee on headquarters."

Secretary Sinclair of the Railway Master Mechanics' Association has issued a circular similar to the above, but it mentions that rooms at the Stockton Hotel have been reserved for the use of members. Messrs. Blackall, Kells and Sinclair have been appointed a committee on headquarters, and members wishing to secure rooms are requested to apply to the secretary.

Simple Form of Smoke Preventer.

The Atchison, Topeka & Santa Fe locomotives working in and around Chicago are provided with an apparatus, illustrated in the annexed engraving, for automatically operating the supply of steam to jets that draw a current of air through openings in the firebox and provide a sufficient quantity above the fire to prevent smoke. The arrangement is said to work very well and meets the requirements of Chicago city ordinances against smoke nuisances. The device is simply a valve so designed that it is opened and closed by the operating of the throttle lever. When steam is being worked through the cylinders the exhaust draws in all the air required, and this special means of drawing air is put into action when the throttle is closed. It was invented by Mr. F. C. Smith, engineer of tests of the Atchison, Topeka & Santa Fe, who has devoted a great deal of attention to smoke-preventing appliances.



The Link Motion Ahead.

A paper was read by Mr. H. P. Jones, of Portsmouth, N. H., at the last meeting of the American Science Association, in which particulars were given of experiments made to ascertain the relative effect of the link motion and high-class automatic valve gear on steam distribution. The following synopsis of the test is taken from the *Engineer*, New York :

The author constructed curves having for their abscissa percentages of stroke and for their ordinates percentages of the total area of valve opening, belonging respectively to the standard type of locomotive link motion and to the automatic engine at various cut-offs. These curves enable tables to be prepared from which it appears that the automatic engine renders a larger proportion of the port area available than does the locomotive. For example, the automatic cut-off engine at 30 per cent. cut-off permits 43 per cent. of its total port area to be used, whereas only 27 per cent. is available in the case of the link motion.

It is a natural inference that such difference of valve opening would cause considerable difference in the amount of wire-drawing or distortion, as shown by indicator cards.

Examination of indicator cards from the two types of engines, show, however, that for equal piston speeds, and proportion of port area to piston area, the locomotive gear gives indicator cards quite as perfect as the automatic gear, and that the well-known distortion or inclination of the locomotive cards during admission only appears at piston speeds which require a mean velocity of flow of the entering steam above 250 feet per second, which, while frequently demanded in a locomotive, rarely exists in stationary engines which present more perfect indicator cards.

It was further shown by discussion of indicator cards presented, that while the most perfect cards were afforded by " trip motion," cut-off gears like the Corliss, the following conclusions practically apply to all good valve gears, including the locomotive link motion, the automatic cut-off or high-speed engine, the Meyer cut-off and the Corliss cut-off.

1. To avoid more than about one pound loss of pressure between the steam chest pressure and during admission to the cylinder, the mean velocity of the flow of steam through the ports during admission must not exceed 40 feet per second.

2. The admission line remains parallel to the atmospheric line up to a mean velocity of flow of about 250 feet per second, notwithstanding that the loss of pressure between steam chest and cylinder may be upwards of 25 pounds per square inch.

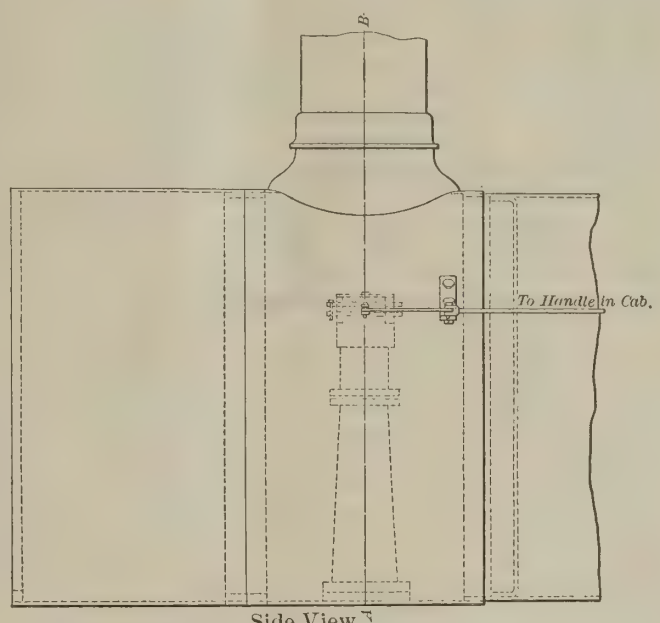
3. Distortion or inclination of the admission line occurs above 250 feet velocity of flow, and in locomotives at 55 miles per hour the velocity of flow is upwards of 400 feet per second. Hence the loss of pressure between the beginning and end of the admission line is upwards of 25 pounds in this type of engine.

The Locomotive Engineer.

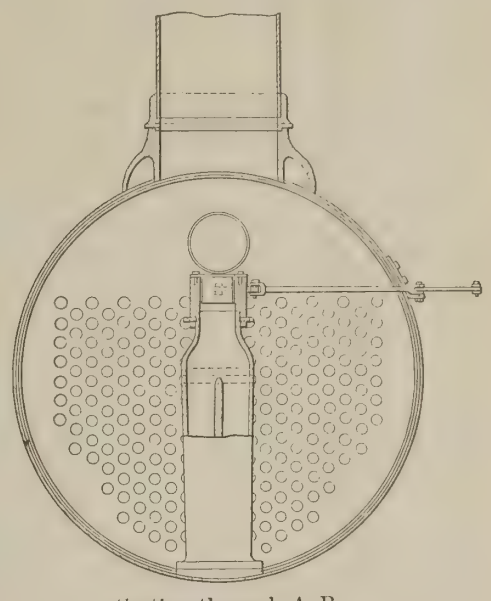
A locomotive engineer has necessarily the qualities which make success in the railway world. The firemen are the recruits for your Brotherhood, but there is often complaint among them as to the methods of promotion. Sometimes it is claimed that it should go only by seniority of service. But there are firemen who in 50 years would never be locomotive engineers, while others in a few years make admirable ones. Some men are too light-headed, and will pull out of a switch before the express has passed, or miscalculate the time for the next turnout, so that constant collisions are occurring with their trains. Some are too bumptious, and will take their chances without first receiving the orders of the train despatcher. But the true locomotive engineer is always a man of sense, of quick thought and courage in an emergency, and in peril a hero. With his train thundering along at the rate of 50 miles an hour and the safety of hundreds of passengers dependent upon his judgment and skill, his decision, made instantly and in the presence of danger, saves the train from destruction many times without the public ever being the wiser. He sees the tottering bridge, the obstruction upon the track, the open switch. The opportunity is before him to reverse and jump or to stick to his engine and perform his duties. In ninety-nine cases out of a hundred he utters a brief prayer, bids a mental good-by to his wife and little ones at home and rescues his train or goes calmly to his death. In the riots of 1863, when the city of New York was in the possession of a mob, trains on the Hudson River road were stopped, and hundreds of women were in the depot at Thirtieth street unable to get to their homes. The rioters threatened to kill any one who tried to move a wheel. An engineer instantly volunteered, and said: "I will take that train up the river." On either side of the road were men frenzied with rage and with drink, ready for murder or any desperate deed, but they were so awed by the calm courage of this engineer that he was permitted to proceed. This last summer, after forty years of service on the Central, this engineer, Henry Milliken, joined the silent majority. His name stands among the unheralded heroes who are the pride and the glory of our humanity. —*Chauncey M. Depew at Engineers' Convention.*

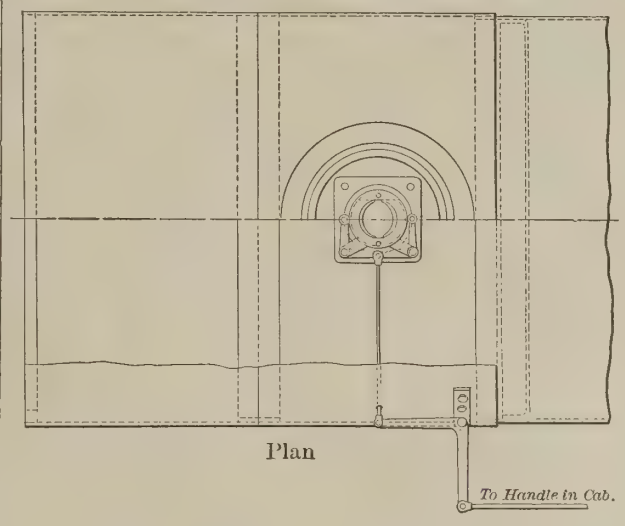
Variable Exhaust Nozzle.

Annexed engraving shows a very simple and practicable form of variable exhaust nozzle invented by Mr. D. Hanney, a mechanic in the Chicago & Northwestern Railway shops at Chicago, and used on some of the locomotives on that railway. A valuable feature about the invention is that it can be easily operated from the cab, and by that means easily adjusted to the requirements of steam making.

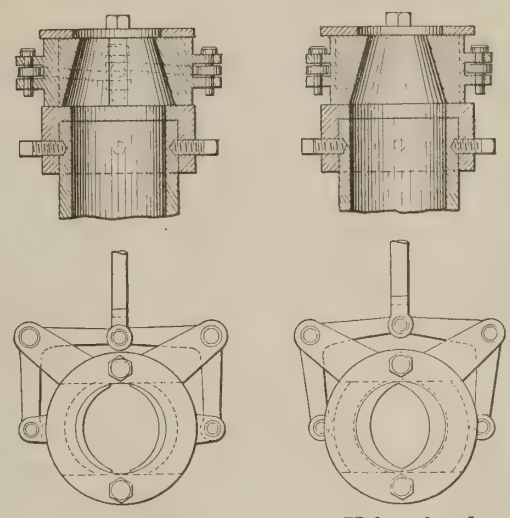


Side View


Section through A. B.



Plan


Valve open Valve closed

Another good point about the invention is that the exhaust orifice is not distorted in shape by being opened or closed. An expanding nozzle is particularly valuable for locomotives engaged on suburban business if the men in charge could only be induced to operate it. A careful test of this nozzle was made with one of the suburban engines, and a material saving of fuel was effected by its use. The saving recorded was about 20 per cent. After making allowance for the saving that always ensues when men are working under the consciousness that they must do their best, there appears to have been a margin of saving, due to the variable exhaust nozzle, which should induce railroad companies to adopt it.

Guiding Action of Pony and Four-wheel Truck.

At a Southern Railway Club meeting Mr. Pulaski Leeds said : The guiding action of the four-wheeled truck does not differ much from that of the two-wheeled. Much of the flange cutting on a correctly built four-wheeled truck is found to take place on the leading pair of wheels, and in some cases it becomes necessary to turn the truck end for end so as to distribute the flange wear. This shows that the leading pair of wheels in such a truck does the most of the guiding. The ten-wheeled engine is in reality simply an eight-wheeled locomotive with the first pair of drivers interposed as a carrier of additional weight. While the two classes of engines, moguls and ten-wheels, are equally safe in passenger service, it is better in the latter service to carry the weight of the front end on four-truck journals instead of placing it upon two or putting it upon the drivers which already have sufficient weight.

I have experimented considerably with mogul engines, having endeavored to so construct the truck that the guiding action would be distributed between it and the first pair of drivers. Most of my experiments have been with the angles and lengths of the suspension links, and I have tried various proportions. When the links are left straight, I find that the drivers do all the guiding and the flanges of the first pair are badly cut. On the other hand I have found it possible to make the angle of the links so great that the flanges will be cut on both the first and last pairs of wheels and on both sides of the engine. To my mind a leading pony truck should be so proportioned that it will neither do all the guiding itself nor leave it all for the first pair of drivers, but will distribute it between the two. I think swing motion trucks on either 8 or 10-wheeled locomotives are a fallacy, and that they are always such except on mogul and consolidation engines. If one will ride upon an 8 or 10-wheeled engine with a swing motion truck he will find that when the engine strikes a sharp curve the boiler front points to the fields and maintains this position as long as the engine is on the curve. It does not come back to a normal position until it leaves the curve. An engine with a rigid truck will take a curve much easier. Such, at least, has been the result of my observation, and I have repeatedly ridden upon both classes of engines for the purpose of watching their behavior in this respect.

Cause of Sharp Flanges.

In steel-tired wheels our records show that nearly 50 per cent. are removed on account of worn flanges, and that 50 per cent. is made up of the wheels on one end of the axle; on the other end of the axle the wheels are worn hollow on the axle away from the flange. Now, if the truck has everything to do with this we must have a terrible bad lot of trucks on our road ! I do not think that is the case, and I am satisfied that if you will look into the matter you will find that nearly 50 per cent. of your steel-tired wheels have been removed on account of one wheel having a bad flange, while the other flange was almost as good as the day it went out of the shop. Again, you go to the yard before the wheels are removed from the axles, and I will venture to say you will find 35 per cent. of the wheels with worn flanges, and each worn wheel with a mate wheel with a flange in perfectly good condition. The question comes up, have these worn flanges been caused by the truck? If the truck runs to one side it may have been so, but my understanding of the position taken to-day is that the trucks are not properly adapted to meet the curves, and that the wear occurs on both wheels as the car moves over the track—so that you are wearing both flanges. Now, I say boldly here that you will not find one pair out of a hundred with both wheels worn badly enough to remove the wheels. As the result of a good many investigations I would say that it is my opinion that four-fifths of the flange wear is caused either by difference in size of the wheels, or by difference in the wearing quality of the wheels. I am positive that that is true in the case of steel-tired wheels, and am almost positive that it is true in the case of cast-iron. And I am also almost positive that one-fifth of the wear is due to the trucks. You will notice that I am taking a radically different position from Mr. Durrell, but at the same time I believe that the relative flange wear is going to determine the relative position of the swing beam and the rigid truck.—*J. N. Barr, at Western Railway Club.*

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

IMITATING PATENTS.

We have heard the complaint repeatedly made of late that many patents obtained by railroad men for devices intended to be applied to railroad rolling stock are close imitations of devices for the same purpose previously invented and covered by letters patent. Those who make these charges allege that when a new and useful invention is applied to rolling stock and begins to display the merit that brings popularity, a crowd of invention imitators at once proceed to see how they can design something of the same kind, something that will perform the same functions and yet escape being an infringement of the article imitated. If they succeed in obtaining a patent, they conclude that their efforts have been successful. There is good reason for believing that many of the men who devote their time to imitating patents would be otherwise employed if they properly realized the nature of the moral principles they were violating.

The laws of the United States give any person who is the original inventor or discoverer of any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, the right to letters patent, which make the machine, design or composition invented as much the property of the inventor as any other article which he may inherit or purchase. Many persons who would scorn the idea of possessing themselves of the ordinary property of any man without giving due compensation, do not hesitate to scheme means of taking away the property of patentees by using the ideas of the original inventor to deprive him of his rights. It is a mistake to suppose that the granting of a patent is good evidence that an invention is original, and that it does not infringe on the rights of a previous inventor. The Patent Office authorities will not issue a patent on a device which they consider an infringement of a patent previously issued, but they often do so, and they are not the final judges of the validity of a patent. That lies with the courts, and the courts have repeatedly displayed no mercy for those who have obtained patents which were imitations of previous inventions. The following extract from the opinion of Justice Blatchford on the Richardson safety valve suits is worthy of the careful consideration of those who are constantly seeking for means to get round patents. It might also be profitably read by railroad managers who have a leaning toward home products of questionable rectitude:

"Richardson's inventions brought to success what prior inventors had essayed and partly accomplished. He used some things which had been used before, but he added just that which was necessary to make the whole a practically valuable and economical apparatus. The fact that the known valves were not used and the speedy and extensive adoption of Richardson's valve are facts in harmony with the evidence that his valve contains just what the prior valves lacked, and go to support the conclusion at which we have arrived on the question of novelty. *When the ideas necessary to success are made known,* and a structure embodying those ideas is given to the world, *it is easy for the skillful mechanic to vary the form by mechanism which is equivalent and is therefore an infringement.*"

The italics are ours, and we wish to emphasize those words of the eminent judge, for they appear to describe to the letter many devices now offered to railroad companies, so called inventions, whose vitality has been drawn from patented articles previously developed and made successful. Let us give a tangible illustration. Ever since the steam engine was invented the engineering world has gone on using the crudest kind of material for gland packing, which is costly, troublesome, and the cause of many delays. Various attempts are made to invent a practicable metallic packing, but without success, till John Odd devotes his inventive mind to the subject. He perceives the cause that made previous attempts failures, and, devising a remedy, produces a packing which is practical and successful. The success that Mr. Odd has achieved directs the attention of a host of imitators, and they immediately proceed to invent metallic gland packing and employ some mechanical equivalent of the means invented by Mr. Odd to produce a packing that will work. When they apply for a patent the attorney takes care to base the claim on some combination of mechanism, and letters patent are granted on that ground; but the patentee considers that he has as good a patent as that obtained by Mr. Odd, the real inventor of the packing. It is a very miserable imitation of another device that a skillful patent attorney cannot obtain a patent on, but the holder of patent papers is often very much deceived when he imagines that he has the exclusive right to sell or manufacture the article that brought forth the patent.

It is the business of certain men in the mechanical departments of railroads to constantly work on the improvement of designs of rolling stock, and it is natural that in pursuing their ordinary duties they should frequently design forms and appliances that are new and useful and entitled to the protection of letters patent. When this happens it is proper that the invention should be patented, if it is only to protect the company using it from becoming the victims of rascals who make a practice of patenting devices invented by other people and then collect royalties from the users. But the man in charge has no right to patent an article devised by his draughtman, unless he has given specific directions that made him the real inventor. When railroad men become patentees in this way they are merely standing on their common rights as men and inventors; but when they take hold of a valuable patent, concerning a device or process that they had never previously thought of trying to improve, and study it out with the view of making something which will perform the same functions without infringing the original patent, they are engaged on a piratical business. There are certain railroads where this kind of work has been largely carried on, and it is a disgrace to all concerned.

Men who engage in the pirating of patents, and use their influence to put them upon rolling stock, are very dangerous adjuncts of a railroad company. If the original of a patented article gives satisfaction, it indicates very bad judgment on the part of those purchasing railroad appliances to select what has the suspicion of being an imitation. It is a business that also entails considerable financial risk, for many railroad companies in the past have paid very dearly for using infringements of patents, and history often repeats itself. It is very bad management to say that the car door sold by Mr. Doe will be preferred to that of Mr. Roe, for the reason that the latter person has made money out of his invention. Men do not generally make much money out of poor inventions. We live so fast that past events are rapidly forgotten, and our railroad managers evidently remember nothing about the ancient history of patent decisions that nearly ruined various railroad companies within the last twenty-five years. Between seven and eight millions of dollars liabilities were incurred for using headlights that infringed the Williams patents; the Tanner brake decision amounted to over sixty millions of dollars; and the illegal use of a minor article employed in mending rails brought a decision requiring five railroad companies to pay nearly two million dollars. Railroad managers nowadays are depending upon the Eastern and Western Associations to prevent them from incurring the liabilities for patent infringements that nearly ruined many companies years ago, but recent events indicate that the protection is by no means effectual.

MAKING DIVIDENDS BY RUINING ROLLING STOCK.

One of the first manifestations of a change in the management of the Union Pacific Railway has been a general reduction of the working force in the repair shops belonging to the company. The volume of business offered to the company has been so heavy for months that the rolling stock was not able to handle it, and we have the best of reasons for knowing that, owing to severity of service, accidents and the scarcity of the plant that prevented the necessary repairs from being executed, the rolling stock of the road is simply in a deplorable condition. This being an admitted fact, it seems the height of folly to attempt to reduce operating expenses by further debilitating the apparatus on which the earning power of the corporation depends.

The prosperity of a railroad company depends primarily upon the rolling stock being maintained in the condition to transport passengers and freight at the lowest possible cost. If the track structure is in bad order, the locomotives and cars will be hard to keep in order. On account of this there are two things essential to a prosperous railroad, viz., good permanent way and good rolling stock. When these are provided the company is in a position to do a profitable business; without them any apparent prosperity is deceptive and certain to be of short duration.

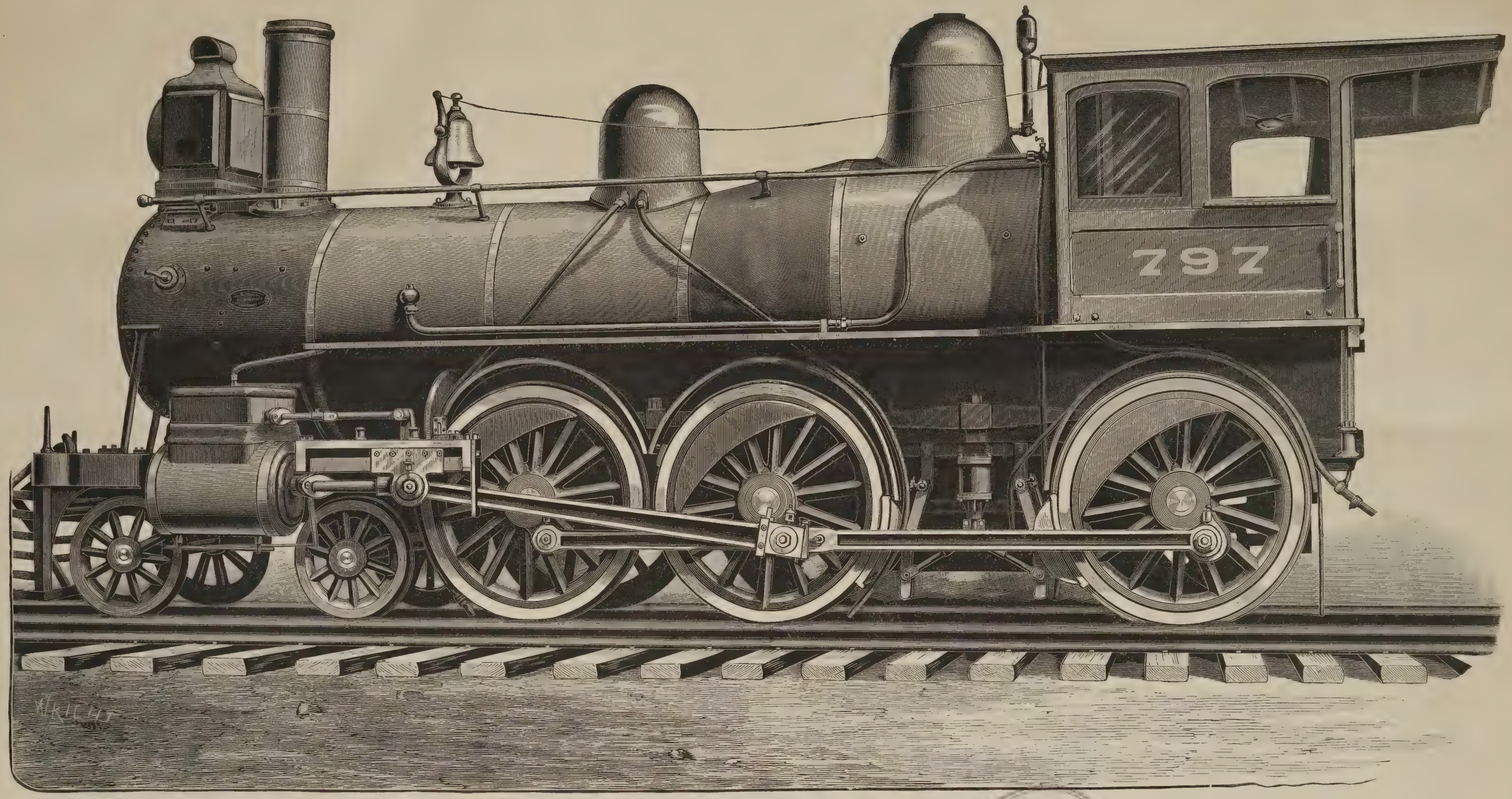
There are two distinct methods of managing railroad property which have become conspicuous of late years. One method is to keep everything that earns money in first-class order, just as an enlightened farmer maintains his chattels or an enterprising manufacturer his tools and productive machines. The other plan is to spend no dollar to-day that can be postponed till to-morrow; to spend nothing on track or bridges or roadbed that can possibly be avoided, and keep locomotives and cars running without repairs till failure forces them into the shop. This is a peculiarly American practice, and is generally pursued to further the ends of stock manipulators. It is the method favored by speculators who are striving to obtain dividends that are not earned. Permitting the structure and machinery of a railroad to run down that apparent large net earnings may be divided is really paying dividends out of capital stock. This practice inevitably brings disaster to the companies that follow it, and ruin to the stockholders who remain ignorant of the true condition of affairs while the property is undergoing the wrecking operation. The men who inspire the policy of permitting the plant to fall into decay reap the harvest of artificial earnings and then sell out before the day of reckoning comes. These are the practices that generate anti-railroad sentiment and bring American railroad securities into disrepute.

UTILITY OF VARIABLE EXHAUST NOZZLES.

We have several times lately illustrated variable exhaust nozzles, and another of these devices will be found shown in another part of this paper. We are aware that among many master mechanics and enginemen a strong prejudice exists against all kinds of exhaust nozzles that depart from the rigid double form, and that many men connected with locomotive operating are particularly antagonistic to variable exhaust nozzles. They say truly that a great many different forms of exhaust nozzles have been tried and abandoned for cause, and the impression is widely entertained that no practicable variable exhaust nozzle will ever be produced. We are of a different opinion. Many devices that are now considered necessary attachments of all locomotives were for years regarded as failures, or of no practical value. Among these may be included balanced valves, brick arches, automatic lubricators and even injectors. The conditions that converted failure into success in regard to the appliances mentioned are likely to make variable exhaust nozzles a recognized necessity for locomotives burning coal of uncertain quality.

Let us consider the case of the brick arch which has proved itself one of the best money saving attachments ever put into a fire box. For years it was tabooed as worthless by most of those who had tried it. The temporary unpopularity of this aid to combustion was due to the fact that it required some attention, and it was declared a nuisance by people who wanted it to save fuel without giving it any care in return for its services. A brick arch would be applied to one or two fire boxes on a road where none had ever been used before. To make the thing a success was nobody's business. The fireman found that with the brick arch in the way he could not throw coal into the fire-box in the reckless fashion common with the plain fire box, and he declared the thing no good. By throwing a considerable part of the fuel above the arch he would choke up part of the flues and make the arch detrimental to free steaming. Then the engineer would conclude that the brick arch wasted fuel and led to the making of less steam than with the plain fire box. When the arch was finally accidentally knocked down on the road by the fireman hitting it with a lump of coal, and time was lost in getting the fragments of brick removed, the master mechanic made up his mind that a brick arch was more trouble than it was worth. This describes the experience of more than one railroad company. The merits of the brick arch were maintained by a few master mechanics, who insisted that it should be properly cared for; and when they learned how to care for the arch the engine men became its warmest friends. Anything that saves fuel soon finds favor with engine men, if they are properly instructed of its use and purpose.

Nearly all our locomotives burn more fuel than they ought to, and this is due in a great measure to the use of small exhaust nozzles. There is a general tendency to make nozzles as large as possible; but they must not be opened out so that the exhaust will not be sharp enough to burn the worst kind of coal supplied. Perhaps once in a month a supply of coal will be given that requires the use of a sharp blast, and for this rare occasion the nozzles must be regulated to uselessly devour fuel the rest of the time. This is a very wasteful practice, but it pays a rail-



RHODE ISLAND TEN-WHEEL PASSENGER LOCOMOTIVE.

USED ON CHICAGO, MILWAUKEE & ST. PAUL RAILROAD.

LIBRARY

road company better to throw away fuel twenty-four days than to have an engine stalling for want of steam and disorganizing the train service on the twenty-fifth day. The business remedy for this is to use an exhaust nozzle that can be opened or closed according to the demand for draft. A variable exhaust nozzle that will fulfill these conditions can be produced and made a success if it has the necessary mental energy behind it.

In conversing with those who have tried expansion nozzles, we have learned that they would work all right for a short time, but that they soon got out of order and then had to be abandoned. The smoke box is a place where a movable device soon becomes rigid through deposit of solidifying substances. If the mechanism that opens and closes a movable nozzle is not operated for a trip or two the parts become fixed. This is how the expansion nozzles soon become stationary and are declared a failure. If there is no remedy for this, variable nozzles will never be made a success. While the injector was used only at rare intervals it had few friends. Regular use soon demonstrated that it was the most reliable boiler feeder that could be provided. Regular use might give variable exhaust nozzles as good a reputation as every fuel-saving device deserves to possess.

INFERIOR STEEL AXLES.

We have believed for years that there was something curious about the experience of different men with steel axles under cars. On some roads steel axles are almost exclusively used, and there appears to be no trouble experienced with breakage or with journals wearing unduly or heating. On other roads again the men in charge have nothing but words of reproach for steel in all forms except in that of plate. As material for axles it has a particularly evil repute. In conversation with a superintendent of machinery who had recently specified steel axles for new cars, we learned some facts that may account for the diverse reports that circulate respecting that kind of axles. When the axles that had been ordered were tried under the ordinary test, several of them broke very readily and the lot had to be rejected. Investigation brought out the information that the firm supplying the axles were in the habit of making two kinds. One kind was made with a view of enduring the M. C. B. test for car axles, and was entirely reliable, and the other was of an inferior quality with which no guarantee was given, and evidently made to sell cheap. The men who inspire the putting upon the market an axle of this character are doing their best to bring all steel axles into disrepute. If an axle is not made with a view of being strong enough to carry fairly heavy cars with safety, it will not stand the ordinary drop test, and if it is too weak for that it has no right to be used at all. The purchase of such an axle is next to a crime, for putting it into service is recklessly endangering the lives of trainmen and others. We would strongly urge master car builders who specify steel axles to make certain that they are subjected to the proper tests for proving their strength before they are put under cars.

AGAINST BLACKLISTING OF RAILROAD MEN.

Blacklisting of railroad employés was at one time a very common practice with officers in charge of the operative departments of railroads, but the practice is getting into disrepute and in some States laws have been enacted which make blacklisting a crime. The Supreme Court of Texas has recently decided a case which has an important bearing on this matter and will be of interest to many railroad men of high and low degree. The Missouri Pacific Railroad officers discharged a man for incompetency and blacklisted him, with the result that he was unable to obtain employment on other railroads. He sued the railroad company for damages, and although defeated in the lower court, he was awarded $10,000 damages by the Supreme Court. Few men who can dispassionately weigh the relations between the officers and men in railroad service will question the justice of this decision. If railroad officers will use care and judgment in preventing the hiring of incompetent men upon their own road, they will have enough to do without interferring with the men to be employed by other companies.

There are some railroad men, including officers, who are so mean, incompetent and reckless that they do not deserve employment, and will not obtain it on well managed railroads; but the circulating of a black list to prevent these men from being put in responsible positions will never fail to strike men who are worthy of being retained in railroad service.

The fact that a railroad manager or superintendent considers it desirable and proper to discharge a subordinate is by no means trustworthy evidence that the act is just or deserved. The cases are not rare where men have been discharged for faults that were not their own and for the purpose of trying to screen the incompetency of those higher in authority. Those who are ready to perpetrate injustice by making discharges on false pretenses are generally vindictive enough to blacken the character of the victim, even to the extent of blacklisting him. There are also men in railroad authority who have furious spells when they go round amidst helpless subordinates like wolves in a fold, wounding through the instincts of their native savagery. If the victims are not meek and submissive, the tyrant blow is struck and more men are looking for employment. Again, in many cases, blackening of character is resorted to as an outward justification of the iniquity inflicted. Officials of this stamp ought not to have the smallest influence in preventing men from obtaining employment on roads better managed than those from which they have been unjustly driven. To give the official of any road the right to interfere with the employment of certain men on other roads opens the way for the worst class of officers to exert their evil influences. We earnestly wish that the wicked railroad official referred to was a greater rarity than he is. To the credit of the owners of railroad property, he is getting scarcer, but there are few systems which do not continue to have some of the type portrayed.

RAILROAD OWNERS AGAINST FREIGHT AGENTS.

During the recent rush of business on Western railroads, due to the transportation of last year's crops to market, most of the lines were worked beyond the capacity of their rolling stock; yet owing to the well-known inclination of the different companies to strive for a large share of the traffic by offering senselessly low rates, the greater part of the business done brought no profit to the carriers. An agreement was made a year or two ago by the presidents of the principal Western lines to maintain rates so that transportation companies might make a living profit, and an organization was formed to regulate the business and prevent rate cutting. But the general freight agents proved to be more powerful for evil than their managers were for good, and the rate cutting went on, and the railroad companies kept hauling freight at or below cost. So long as freight is secured the ordinary freight agent cares nothing about the cost of moving it, bankrupting the road. If he takes the business from some rival he is happy, and feels that he has not lived in vain.

As the railroad presidents failed to control their subordinates, the owners of railroad property became alarmed and the great banking houses of Drexel, Morgan & Co., and others of New York, induced the leading railroad presidents of the West to hold a meeting in New York, and consult together for the purpose of devising some means of maintaining rates, or in other words to try and put the freight agents on their better behavior. A new association has been formed with an advisory board, consisting of the president and one director of each railroad company. The business of this board will be to establish and maintain uniform rates between competitive points, and to decide all questions of common interest between members of the association. Some of the Western roads keep aloof from the association, but a sufficient number has joined it to make rate cutting outside of the organization harmless if those inside would only look at the matter in a sensible manner. The new bonds of harmony have not, however, been inaugurated by the decapitation officially of the principal freight agents, and we are afraid that this spirit of leniency and forgiveness will eventually put the roads again under the feet of their worst enemies.

RE-USING EXHAUST STEAM.

About 1,170 heat units have been expended upon every pound of steam used by a steam engine working with a gauge pressure of 140 pounds to the square inch. In the case of locomotives over 90 per cent. of the heat devoted to boiling the water and to forming the high pressure steam escapes to the atmosphere through the exhaust pipe. On the face of it, this appears to be an enormous waste of potential power, but the loss seems to be inevitable. The exhaust steam resembles the water passing from a turbine, little diminution of energy having resulted from the per formance of the work. Ever since the steam engine came into use many of the ablest steam engineers have devoted themselves to devising means of taking more work out of the exhaust steam, but remarkably little improvement has resulted from their labors. With many stationary engines a considerable portion of the heat carried out by the exhaust steam is saved by heating the feed-water, but this is not practicable with locomotives.

The waste of heat through the exhaust has induced a great many inventors to attempt the action of returning this steam to the boiler, and not a few persons have lost money by taking stock in inventions that had this purpose in view. To a man not well versed in steam engineering matters it seems a perfectly rational and practical idea to save the exhaust steam by returning it to the boiler. Those better informed know that the thing cannot be done. It would be just as easy to provide means for making the descending momentum of a pile-driver hammer raise weight to be ready for the next fall.

We have lately heard that parties in Chicago were preparing to push into use the Prosser motor which was tried in street car service in Wisconsin a year or two ago. This engine was designed for the purpose of passing a portion of the exhaust steam into the boiler, and great saving of fuel was claimed for it. We have the best of reasons for knowing that the attempts met with the usual failure. The theory followed was to give the steam a free passage from the cylinder to a valve that connected with the boiler, and it was expected that the momentum of the steam would raise the valve as water does when passed through an injector. The trouble was that the steam does not acquire the essential momentum. It is lacking the necessary weight. Those familiar with physics know that it would be an impossibility to make an injector pass steam into a boiler; yet this was really the problem that the inventor of the Prosser motor attempted to work out.

Attempts of this kind have been made repeatedly, and only six or seven years ago the Marchant engine created a great sensation in England and deceived engineers of high repute. That motor was supposed to use part of the exhaust steam, but the deceptive part was performed by roguery. When our inventor claims to effect great saving of fuel by using the steam over again, his hearers may safely conclude that he is either a rogue or a fool.

In the discussion by the Southern Railway Club of joint car inspection it was brought out that at certain interchange centers where a form of joint inspection is in vogue the joint inspectors are under the charge of the traffic superintendents, and the effect of the arrangement is that the inspectors are very ready to ignore the M. C. B. rules of interchange of cars. This is a matter which the superintendents are very foolish in meddling with. It belongs to the car department, and the interests of all railroad companies concerned would be promoted by leaving the control of the joint inspector in the hands of the men best able to understand the merits of disputes that will arise in the best regulated interchange centers. Obedience to the spirit of the M. C. B. rules of interchange of cars is the only way in which the business between connecting roads can be carried on with any degree of harmony. When an inspector is responsible to authority that he concludes cares little for the M. C. B. rules, he only follows the weak dictates of humanity when he frequently ignores the plain terms of these rules. If a railroad company is not prepared to place the joint car inspectors under the officers whose voice and council have been instrumental in perfecting the M. C. B. rules of interchange of cars, it would better decide to withdraw altogether from connection with the association, for rules of this kind that are not enforced merely become forms for enabling unscrupulous men to follow dishonest practices.

The proper design of a pony truck for mogul and consolidation locomotives has been a question that has excited great conflict of opinion. The proper length of the radius bar and the form and length of swing hangers have been objects of dispute and any accurate information on the subject ought to be welcome to people in charge of engines that use pony trucks. To these we commend a careful perusal of the remarks made by Mr. P. Leeds on the "guiding action of pony and four wheel trucks" to be found in another column. Mr. Leeds tried various proportions of angles and lengths for suspensions links. When the links hung straight he found that the front pair of drivers did all the guiding round curves and that the flanges wore rapidly. On the other hand, the links could be set at an angle which would put all the wear on the flanges of the first and last pair of wheels. This would indicate that a proportion might easily be found which would distribute the wear evenly between truck and driving wheels. It has only been within the last year that the voice of Mr. Leeds has been heard in the discussion of railroad mechanical matters; but we already notice that his utterances attract general attention, for he seldom speaks without throwing new light on the subject under investigation.

In another page will be found a very interesting letter on effects of throttling steam, written by Mr. George H. Baker, of Uruguay, who was for several years instructor of enginemen on the Chicago, Burlington & Quincy, and was noted for his familiarity with the economical operating of locomotives. The letter is based on a misconception, but it is, nevertheless of great value and interest to those concerned in the running of locomotives with the least possible expenditure of fuel. Very careful experiments have demonstrated that where a small volume of steam was passed through the cylinders of a compound engine, it was more economical to restrict the supply by throttling them by an early cut-off; and the committee of the Master Mechanics' Association mentioned this in their report on compound locomotives. It was not understood that they advocated or defended the pernicious practice of throttling with simple locomotives, The cut-off of a simple engine is never likely to be too early to make throttling desirable.

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Our readers will find this a useful work of reference for required information in all publications of a technical nature. The catch-words are given in three languages—English, French and German—so that readers of every nationality can at once turn to the branch he seeks in the literature of the latest investigations. An exhaustive enumeration of the technical journals in the three great languages of the world is also given.

Personal.

Mr. W. L. Tracy, division master mechanic of the Central of Georgia at Macon, Ga., has resigned to accept a position on another road.

The Richmond & Petersburg Railroad Company (office, Richmond) will, it is stated, erect new machine shops and roundhouse at Manchester, Va.

Mr. J. W. Sanford, master mechanic of the Pennsylvania shops at Jersey City, has been confined to bed for several weeks suffering from a severe illness.

Mr. Samuel P. Bush has been appointed acting master mechanic of the Dennison division and shops of the Pittsburgh, Cincinnati, Chicago & St. Louis.

Mr. Robert B. Cable, superintendent of the main line division of the Philadelphia & Reading, has been appointed general manager of the Jacksonville, Tampa & Key West systems.

Mr. Geo. W. Ettenger, who has been for several years general manager of the Iron Car Company, New York, has become associated with the Charles Scott Spring Company, Philadelphia.

Mr. D. G. Mott, for some time an engineer of the New York elevated railroads, and before that an employé of the Intercolonial, has been appointed Master Mechanic of the Panama Railroad.

Mr. Charles Graham, superintendent of motive power of the Delaware, Lackawana & Western at Scranton, has been confined to bed for several weeks with a severe attack of his old enemy, rheumatics.

Mr. W. F. Turreff, late superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis has been appointed assistant superintendent of motive power of the Erie, with charge of all lines west of Salamanca.

Mr. E. G. Allen, who left the New York, New Haven & Hartford lately to take a position as superintendent on the New York Central, has changed again and become superintendent of the main line of the Old Colony railroad.

Mr. E. P, Boatman, who has been for years master of machinery of the Ohio & Mississippi, has been appointed superintendent of machinery of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Indianapolis, Ind.

Mr. A. A. Jackson for the last four years general superintendent of the New York & New England, has resigned. Mr. Jackson has had a somewhat varied railroad experience, principally on the Baltimore & Ohio and Pennsylvania systems.

Mr. J. G. Thomas, for some time master mechanic of the Philadelphia & Reading's Philadelphia division, has been transferred to Reading, where he will have charge of the principal shops there. He was formerly an engineer on the road.

Mr. E. B. Thomas, for some years second vice-president and general manager of the Erie, has been elected first vice-president to succeed Mr. S. M. Felton. It is understood that Mr. Thomas will retain charge of the operative department of the road.

Mr. S. H. H. Clark has been appointed general manager of the Union Pacific, a position which he left in 1884. He retains the position of general manager of the Missouri Pacific and it is understood that Mr. Holcomb will perform the executive duties of general manager of the Union Pacific.

The line of the Pennsylvania Railroad, from Frankford Creek, on the south, to Poquessing Creek, on the north, at Torresdale, a distance of nearly seven miles, is soon to be lighted by electric lights ranged along at intervals, so that for that distance the tracks will be as light as Chestnut street, says the Philadelphia *Ledger*.

Mr. T. A. Fraser, who left the Minneapolis, St. Paul & Sault Ste. Marie six months ago to take charge as superintendent of the Wells & French car works at Chicago, is achieving great success in his new position. Under his able management the works are now turning out close on thirty new cars daily.

Mr. A. B. Burtis, who has been connected with the Sherwin Williams Company so many years and is so favorably known among railroad men all over this country, announces that, in company with four other friends, he has commenced the manufacture of high grade paints and colors for railroad use.

Mr. William Argue has recently been appointed master mechanic of the Savannah, Americus & Montgomery Railroad. Mr. Argue, who is open to conviction on all railroad mechanical matters, was for some time superintendent of the East Birmingham Iron and Foundry Company's Works, having left a railroad shop to take that position.

The sensation in the Union Pacific machine shops, says a Salt Lake paper, is the resignation of Master Mechanic Bywater, by request of General Master Mechanic Middleton. Bywater is an old Mormon elder who has been with the road for years, and a younger man is wanted.

Mr. Samuel Irvin, master car builder of the Missouri Pacific, has resigned after having held the position for eleven years. The appointment of Mr. Reardon as superintendent of motive power and rolling stock put Mr. Irvin in a subordinate position, and he did not feel inclined to accept negative promotion.

Master Mechanic Smith, of the Rio Grande Western, has been let out after being given a two months' vacation in California and Colorado, and Major Dailey placed in charge. The Major has for some time been "bishop coadjutor with the right of succession," and is much thought of. He is a graduate of the Baldwin shops.—*Western Railway.*

Mr. S. M. Felton, for some time first vice-president of the Erie, has been elected president of the East Tennessee, Virginia & Georgia. In his past career Mr. Felton hds been noted for following the policy that new railroad men are better than old ones, and not a few of the men belonging to the East Tennessee system are waiting anxiously for developments.

Angus McPherson, of Cumberland county, Nova Scotia, has built a railroad a little over a mile long, which runs into his lumber woods. It is singular in that the rails are spruce poles, and the sleepers are small round poles. The rolling stock consists of an upright engine of eight horse power, and two flat cars. The track, which is not graded, cost about $300 to lay.

The wife of Mr. C. E. Slayton, Traveling Engineer of the C., St. P. & K. C. R'y, was killed last month by a C., St. P., M. & O. train at University Station on the Great Northern line between St. Paul and Minneapolis, as she was about to board a Great Northern train on another track. Mr. and Mrs. Todd, Mrs. Slayton's father and mother, were also killed at the same time.

The many friends of Mr. R. W. Bushnell, master mechanic of the Burlington, Cedar Rapids & Northern, will be sorry to learn that he lost his wife last month. Mrs. Bushnell was well known to those who have attended the conventions and was one of the most popular ladies at those meetings. She died from cancer of the breast, which has been slowly taking away her life for two years.

Mr. George W. Richardson, inventor of the pop safety valve, is lying at his home in Bridgeport, Conn., prostrated with a stroke of paralysis, from which his recovery is very doubtful. Mr. Richardson was in railroad service for many years, having been a locomotive engineer on the Troy & Boston when he invented the safety valve. He was afterwards general foreman of the shops at Troy and left to engage in the manufacture of his safety valve.

Mr. D. H. Nichols, for several years general superintendent of the St. Louis & San Francisco, has been appointed general superintendent of the New York & New England. Mr. Nichols rose on the St. Louis & San Francisco from the position of office boy. Was successively clerk, brakeman, conductor, freight agent and superintendent. It goes without saying that he is a thoroughly practical railroad man. He was very successful in the West in handling traffic with limited facilities.

Maj. Sherman Conant, Superintendent of the Florida Southern Division of the Jacksonville, Tampa & Key West, died at Palatka, Fla., last month, of pneumonia. He had been sick only a week and his death was unexpected. Maj. Conant was about 50 years old, and had been in the railroad service for the last 18 years. He had been General Manager and Superintendent of the Florida Southern since Jan. 1, 1883. He had previously been General Manager and Receiver of the Jacksonville, Pensacola & Mobile.

A life-like portrait of Mr. J. M. Toucey, general manager of the New York Central, appeared in the last number of *New York Railroad Men.* An interesting biographical sketch accompanies the picture. Like many other Americans who have attained eminence, Mr. Toucey began his working life by teaching school. From that he changed to be a station master, which led the way to various responsible positions in railroad service, ending in his reaching the place of general manager of one of the finest railroads in the world.

College Graduates on the Union Pacific.

Mr. Isaac Bromley, a well known writer and railroad lobbyist, has been writing some "chapters" to the New York *Tribune*, on Union Pacific affairs. Six late chapters are devoted to showing that the embarrassments which the company recently fell into were not caused by the mismanagement of college graduates, as the public was led to believe, but by the shortcomings of ultra practical railroad men. The following extracts will interest those who suppose that the college graduate has been discredited by the prominence given him in connection with the Union Pacific management:

Whatever may be said of college graduates in general and their unfitness for practical business, Mr. Adams' administration of the Union Pacific cannot be discredited on that score. He had predilections for educated men in the railroad service; theories, to be sure, but theories of a sort that fortunately are taking daily a stronger hold on the business, social and political life of the country; theories based upon the fundamental principle that intellectual training is useful and practical instead of merely ornamental, and that there is no walk in life in which it is not of the highest advantage. He had talked and written so much on this subject, and his utterances had as usual been so widely read and commented upon, that his advent to the actual administration of a great railroad company was supposed to presage a general discharge of the practical men who had grown up in the service and the instalment of college graduates in their places. So when his administration came to grief some people said confidently: "This comes of the wild notion that railroads can be managed by college graduates. That experiment having failed, we shall now return to the safe and profitable plan of railroad management by men brought up to the business, who know it all from a spike to a locomotive, and know nothing else." Unfortunately for this assumption, it is not warranted by facts. At the points where the management broke down "practical" men. brought up to the business, not college graduates, were in charge.

. . . . . .

It is only fair that so much of the inside history of Union Pacific operations as has here been given should be made public. It is necessary in order to do away with the false impression that the Adams administration fell down because it proceeded upon the theory that educated men are competent for practical business affairs and railroads can be managed by college graduates. The college graduate need not be dismissed to other callings because he has failed in this. For in this failure only one college graduate is concerned, and that is Mr. Adams himself. And even he has this defence for his theories, that, if he had actually enforced them, instead of pursuing the more conservative policy of taking things as he found them, and working with such tools as were ready to his hand, he might have brought out better results.

The names of a number of men who have been prominent in the operating of the Union Pacific are mentioned in the articles. Some purely practical men are discredited and some college men have had their work commended. In the latter list the name of Mr. Baldwin, assistant to the vice-president, has evidently been overlooked. Mr. Baldwin distinguished himself by straightening out the affairs of the Montana Union, which had always been particularly crooked until he went there.

Retaining Rings.

While admitting that, in theory, the retaining rings have advantages, it is undeniable that in fact or actual practice these advantages do not exist, and that there are disadvantages which more than offset the supposed advantages claimed. These retaining rings slots or grooves cut up in the tire a full three-quarters of an inch and besides actually wasting this great quantity of valuable metal (say 75,000 miles of service), the tire at this vital point (where flange strains are taken on curves) is dangerously weakened by these retaining ring grooves. As the tire wears down and is turned it will be found that the metal runs out, or is thinnest at this point first, and that your wearing limit is (three-quarters or one inch, as the case may be), from the outer edge of the slot or groove. These retaining rings are supposed to hold in position section of tire should it break crosswise, in two places. My experience and observation leads me to believe that this double break or fracture never occurs. Pieces of the flange starting at the fillet and running out at a point above the base of the tire and above the point where retaining rings enter, have, in one or two instances, in all the steel wheel records of this country been known to occur, but the retaining rings would have, and did not play any part in preventing this. Because of the nature of steel these defects are usually discovered before the danger comes.—*G. W. Rhodes at Western Railway Club.*

A crack in a piece of metal is prevented from extending further by the well known means of drilling a hole where the rent ends; but when the hole is not bored on just that spot the crack is apt to continue beyond the hole. To facilitate the search of the exact point, *Revue Industrielle* recommends moistening the cracked surface with petroleum, then wipe it and then immediately rub it with chalk. The oil that has penetrated into the crack exudes and thus indicates with precision where the crack stops.

There has been a great deal of talk for months past of difficulties between the Erie management and the trainmen that were likely to culminate in a strike. It was not easy to find out exactly what grievances the men resented most, although a long list of demands were presented to the officers of the company. A settlement has been effected which is said to be mutually agreeable. The principal concession made is that men who have been suspended when they were not at fault shall receive full pay for the time they have been idle. An improvement on this would be to never suspend a man till investigation had shown that he deserved to be laid off. Some small concessions were made to the trainmen in the matter of pay but no general increase of wages was granted.

Communications.

Detailed Plan of Joint Inspection of Cars.

Editor National Car and Locomotive Builder:

The question of a standard system of joint inspection at junction and interchange points is now a living one, and the Master Car Builders' Association has taken hold of it by putting it into the hands of a vigorous committee. In some localities "joint inspection" has been in use in some form or other for eight or ten years; the experience gained has exposed the weak points, which have been somewhat remedied or improved on in the establishment of joint inspection at other points. That no existing plan is perfect goes without saying. By a combination of all the good points of all the existing plans an almost perfect system can, without doubt, be established. To undertake to adopt a plan suitable for large interchange points like Chicago or St. Louis to points like Detroit, Buffalo or Pittsburgh, or a plan suited to the latter places, and expect it to work at points where only two or three roads interchange, would be preposterous.

The following draft of plan suitable for three different localities may not meet the views of all car masters, but is given for the benefit of those that want light on the subject.

CHICAGO

will be taken as a basis for a system which doubtless will be the best sample, as it is the most complicated. Chicago should be divided into three districts, with a joint inspector over each district, as it would not be possible for one man to properly supervise the whole, but it would be quite possible for three men to do it satisfactorily, and be at each inspection station at least once a day. The whole to be under one superintendent of inspection or arbitration, each road to maintain the car inspectors in its own yard, the same to do both *in* and *out* bound inspection except in case of roads that have separate yards for *in* and *out* bound business, and too far apart for the same inspectors to work them both. Then, of course, it would be necessary to keep two sets of men. Under this system it will not be necessary for any road to have inspectors in other yards than their own. Such is the outline of the inspection staff. Now as to how the work can be done. All cars for

INTERCHANGE INSPECTION

must be thoroughly inspected on arrival at inbound yard; all defects must be repaired before delivery for interchange, except it be on a car that is homeward bound; then if the delivering road so elects it may put on M. C. B. *defect card*, providing the defects are safe to run to destination. On arrival of cars at outbound yard they must be again inspected by receiving road in order to make sure that the delivering road has not overlooked or neglected any defects, or that cars have not been damaged in the interval between the delivering and receiving yards. If defects are found that are not covered by a card the repairs may be made and referred to the district joint inspector, who will decide as to the responsibility of defect, and if done by road delivering he may issue an order on same for cost of repairing the defect; such order must accompany bill as voucher. This is a double inspection, which insures as nearly as possible a perfect inspection; at any rate it leaves it entirely in the hands of the outbound road to have the car in good order before departure. All cars for

LOCAL OR CITY DELIVERY

must be inspected on arrival at inbound yard before distribution. All defective cars that cannot be repaired on the spot without delay, that have to be delivered on private sidings or to other roads, and are safe to run, may be red-carded (hereafter described), which means that the car will be received back when empty with the defects enumerated on the card. In case the car belongs to a car company or the road unloading, and is required for reloading, the repairs may be made and charged to the road that put on the card, the card to accompany bill as voucher. Under no conditions must a car with a red card attached be reloaded away from home without repairs being made. If such car is reloaded and not repaired, and it becomes necessary to transfer the load in order to do the repairs, the road transferring may charge the road that loaded the car with cost of transfer, the district joint inspector to decide the case and issue the order for transferring, the order to accompany bill as voucher.

This is an outline of the two classes of inspection, viz.: that for interchange and that for local or city delivery, which may be operated uniformly in Chicago. Doubtless there are conditions which may require some slight alteration. For instance, the stock yards may involve a different arrangement in some of the details, but not enough to affect the main plan. Admitting that it would be next to impossible to operate satisfactorily to all parties interested a system of joint inspection where all the interchange inspectors would be under one man, as has been demonstrated at smaller places; it is quite possible the plan here submitted can be worked in Chicago. Under this plan the

CAR INSPECTORS

would be directly under the car foreman of the yard in which they work, and paid by the company they work for. For this reason it has been asserted that they would slight their work by overlooking defects, and letting cars pass defective. This would soon recoil on them by force of the second inspection, which would be done in the outbound yard of the road which received the cars; and any defects that were found that had been overlooked by the first or inbound inpection would be charged back, and too many bills of this kind would soon attract attention at headquarters, and an explanation be demanded, which is not always pleasant or profitable. A third or even a second appearance on the carpet has been known to result badly to the party called up. Therefore the fear of a one-sided or partial inspection is only like a ghost story to a clear mind. No! the result would be anything but partial, as has been proven at other lesser points, where the double inspection plan is operated. In fact it has a tendency to cause the first, or inbound inspection, to be exemplarily done in order to show the second or outoound inspectors "how to inspect cars," if not to keep the number of the district joint inspector's orders down to zero.

IN THIS PLAN A RED CARD

is proposed. In a large railway center like Chicago it would be hardly possible to operate a joint inspection without some way to handle defective cars under load with city or transfer freight. The red card should be the same size as the M. C. B. defect card, and lettered on both sides thus (*) and used by the road that wishes to place a defective but safe car on a foreign track for unloading. As shown on its face, it indicates that the car will be accepted back with the defects named on the card. Under no condition should a car red carded be permitted to be sent outside of the Chicago districts, as the card should not be recognized outside of Chicago; therefore it is not good on an interchange car, and should not, under any circumstances, be used for such.

To operate successfully this plan it will be necessary to have first a

SUPERINTENDENT OF INSPECTION,

or arbitrator, who should be a man thoroughly acquainted with everything pertaining to the inspection, repairs and interchange of cars, of sound judgment, quick decision and a good manager, and not least, should have a knowledge of the requirements of the transportation departments. One of the very important parts in a successful joint inspection is to work in harmony with the freight or transportation departments, which is too often overlooked. His duties should be to see that the district joint inspectors work in harmony and according to the M. C. B. rules of interchange and the special rules designed for the operation of Chicago, decide any disputes arising between, also settle any differences arising between the car foreman of inspectors and the district joint inspector. He should keep a record of cars that have been carded and all cars that have been repaired by receiving road, for which an order has been given by the district joint inspector. All matters pertaining to the joint inspection should be referred to him by the roads and car companies interested. Under the superintendent of inspection there should be at least three

DISTRICT JOINT INSPECTORS,

whose duties should be to see that a uniform system of inspection is maintained in accordance with the M. C. B. rules and any special rules that may be in use at Chicago; to decide any differences arising between inspectors or yard foremen in their respective districts; to decide on all defects that are doubtful as to responsibility, and issue order for repair and give an order on the road responsible for defects that may have been overlooked or neglected by delivering road; to issue M. C. B. defect card where required by any of the roads in their districts; also issue local or "red cards" for defective cars for Chicago delivery, and keep a record of all such cards used, also a memorandum of any cases in dispute; also decide the responsibility of defective cars that may have been overlooked or neglected by delivering road or car company and detected by receiving or out-bound road, and issue order for billing the road at fault.

These four are all the staff necessary to be paid jointly by all the roads interested, which, of course, includes necessary office expenses for the superintendent of inspection, whose office should be at a central point, accessible by all the district joint inspectors daily. There should be an

ADVISORY COMMITTEE

of three or five, selected yearly at a general meeting of the heads of the car departments of all the roads directly interested in the Chicago joint inspection, and from among their number. This committee to have power to appoint the superintendent of inspection and dismiss the same, subject to the approval of the general committee; also to approve of the appointment or dismissal of the district joint inspectors when recommended by the superintendent of inspection; to audit and pass the pay roll and all accounts made in the interest of the joint inspection; also sit as a court of appeal from the decision of the superintendent of inspection. Their decision to be final so far as Chicago is concerned.

THE EXPENSE

would be small compared with what it is under the plan of every road for itself. First, the salary of superintendent would cost $2,500, as a competent man could hardly be had for less; the three district inspectors, say $1,200 each; office expenses, clerk, etc., about $1,500; making a total of $7,600 per annum.

THE SAVING

would be largely in the reduction of car inspectors in foreign yards. Under this plan there would be no need for one road to have a corps of inspectors in any yard but its own. Whereas now, to put it at a minimum, the roads in Chicago maintain an average of two car inspectors in every yard they interchange cars with. Say ten roads interchange with nine other roads, to draw it mild, ten roads have 18 inspectors outside their own yards; that means a total of 180 inspectors at an average of $50 per month, which is low. How much is it costing per year? At $50 per month one inspector would receive $600 per year; 180 inspectors would be $600 multiplied by 180. Now this might be cut down some, admitting that one-half of these inspectors could be used in the company's own yard; and yet there is an enormous expense attached to the pastime of one road trying to prevent the other roads getting ahead of it. The low estimate made, $54,000, is but a drop in the bucket with what may be saved by a better and prompter delivery and interchange of freight.

It was stated, when a joint inspection was talked of in Chicago some time back, that it would cost too much. If Chicago will ask Detroit, Toledo, Suspension Bridge or Buffalo what is saved by joint inspection, Chicago may be surprised. In one of these places the saving was 75 per cent. over the old system of every fellow for himself. Yet "the Center of the Universe," ahead in everything else, is behind in so important a matter as the interchange of cars.

If a joint inspection were established it would not only be a boon to Chicago, but would be a benefit to many of the interchange points on through lines. The complaints against Chicago are long and loud, for permitting cars belonging to roads centering there to be loaded, having old defects that cause them to be stopped at some of the interchange stations en route to destination, resulting very often in the road delivering the car having to apply a defect card in order to pass the car through. This is certainly an infliction on the delivering road which should be removed; this would not be so bad if such cars were homeward bound. Unfortunately very little attention is paid to where the car belongs, and there is certainly too little attention given this matter at some other places as well as Chicago. No road should be guilty of allowing one of its own cars or cars from its connections, to be loaded and offered for interchange away from home when known to be defective. Of course where every road is working for itself there will be no end to this sort of thing. A joint inspection system as has been described will be the only remedy for the evils. The sooner the remedy is applied at Chicago the better, not only for Chicago, but for every interchange point that handles cars from that direction. M. C. B.

*Name of Road..... Date.....

Initial..... Car No.....will be received back by the.....at any of their Chicago repair yards, with the following defects:

This card is not an order to repair, and must not be used for defects on cars for interchange. Secure it to car door.

Signature..... Joint Inspector

.....District.

Effects of Throttling Steam.

Editor National Car and Locomotive Builder:

If permitted at this late date to bring up a matter that has gone by the board for several months, I would like to refer to the report of the Committee on Compound Locomotives at the late Master Mechanics' Convention.

All the railroad papers that have come to South America speak, and deservedly, in the highest terms of the report. I do not wish to detract in any way from this merited praise, but I want to point to one expression that I do not think was quite so praiseworthy as the rest of the report, or the report as a whole.

"Thus the conclusion is again brought home to us that the control of the compound, when small horse-power is to be developed, must be chiefly through the throttle wire-drawing in the steam, and thus reducing the initial pressure.

"Putting emphasis on this truth will not frighten those who are familiar with the fact that wire-drawing is common to-day with our best enginemen. And it may be here noted, that the *imperative necessity* for this so-called 'crude practice,' is the full explanation for the slight use in modern locomotives of screw and other finely divided reversing gears."

This gives *Engineering News* considerable satisfaction, for in an editorial in regard to this report in its issue of June 28, it says: "One prevalent delusion, however, we are glad to see the committee quietly sit down on, viz.: that throttling is in itself and under all conditions a wasteful and an unadvisable thing. Much nonsense has been written on the evil effects of this practice." . . . "The average runner may be trusted . . to open his throttle quite as widely as he needs to start his train, and after that, experience seems to indicate that it is quite as eco-

nomical to throttle as it is to cut off much below half stroke, or certainly one-third stroke."

These utterances, coming from a body of such high standing as the Master Mechanics' Association, and from a paper usually so correct in its utterances, except in regard to locomotive operating, are deserving of consideration, as they will undoubtedly have great weight with many people concerned in the most economical methods of the use of steam by the many thousands of locomotives in America. In Great Britain and Europe this will not apply, for there this matter of the proper way to use steam in locomotive operating has long ago been settled in favor of maintaining high initial pressure and using the shortest cut-off possible to do the work, and therefore the locomotives of those countries are equipped with devices for regulating the cut-off accordingly. But "wire-drawing is common to-day with our best enginemen." That *some* of the best locomotive engineers in the United States—*best* so far as handling their trains successfully—use steam invariably throttled, and cutting out at eight, ten and twelve inches of the stroke, is a fact that I acknowledge, for I am aware of it, and because I was many times made painfully aware of it when I was a fireman and had to fire for such men. But it does not follow that because such an engineer exercises good judgment in handling his train, and gives good satisfaction to the train department, that he is an economical engineer. Another engineer who uses equally as good judgment, and makes equally as good time, and uses his steam with the shortest cut-off, consistent with the work, that his quadrant will allow, and full throttle if necessary, will do the work with less coal consumption, and he will therefore be a better engineer than "some of our best." Though few, when compared with the thousands of locomotive engineers in the United States, there are hundreds of the latter sort.

It is one of the most surprising things I know of, that there should be a difference of opinion among well-informed practical men, about the economy of using steam of high initial pressure, with the shortest possible cut-off consistent with the work to be done. It makes one think of the blind who will not see. Hundreds of diagrams taken by the indicator of the action of steam in locomotive cylinders have shown that, to do the same amount of work, a greatly increased amount of steam was used when the cut-off was late and the steam throttled, over what was used when the cut-off was short and the throttle full open. Nor is this all. Such diagrams show increased back pressure for late cut-offs, due to the difficulty of the larger amount, and higher pressure of the exhaust steam in escaping through the contracted nozzles. And we know, that in proportion as the pressure of the exhaust steam is increased, the draft through the fire is increased, burning more coal, carrying more unconsumed coal in the shape of sparks to the front end, and hurrying the hot gases of combustion from the fire-box and through the flues at greater speed, giving less time for the transmission of their heat to the water in the boiler. These combined losses are much greater than any simple loss of cylinder condensation due to short cut-off.

I would call special attention to this action of the high-pressure exhausts of late cut-off steam on the fire and hot gases, in contradistinction of the same of the low-pressure exhausts of short cut-off steam. As a fireman, I first noticed the difference in these two methods of using steam in the decreased draft on my fire, and the decrease in coal consumption and necessary personal effort which naturally followed when the engine was put working at short cut-off. For all I knew then, that was all there was to it, for the cylinder and the steam chest, and what went on within them, were total mysteries to me, for I found it much easier to contemplate the polished brass on the outside, that I had to keep clean, than to bother my head about what went on inside. But as years slid by, and changes of engines and engineers, and even different roads to fire on fell to my lot, I observed that all the engines I fired behaved much differently with different engineers, and three things were impressed upon my mind; namely, that with engineers who run with light throttle and cut-offs as late as eight, ten and twelve inches of the stroke, the engines always burnt more coal, used more water, and I had to work much harder than I did while firing for engineers who made *better runs* and used the steam with the shortest cut-off the notches on the quadrant allowed, and gave enough throttle to do the work.

When I got to be an engineer I adopted the economical method; first in deference to my hard-worked fireman, and, later, when I saw the economy that resulted, in deference to my employers, and with success.

But "The *imperative necessity* for this so-called 'crude practice' is the full explanation for the slight use in modern locomotives of screw and other finely divided reversing gears." What influence had that phantom that the committee could not locate "American Practice" on the writer of this assertion? What is the imperative necessity of throttling that the committee tell us about?

Although I recall the events of fourteen years' experience with locomotives, twelve in the cab as fireman and engineer, I can remember but comparatively few instances where *any* necessity of using steam of late cut-off and reduced pressure existed, except it was due to the faulty construction of the engine, or the crude means the ordinary quadrants furnish of regulating the cut-off to suit the work. In starting trains, and until they gain a speed of about 12 miles per hour, late cut-offs and throttled steam are necessary to prevent slipping; and frequently when the condition of the rails is bad the same applies. The same applies again sometimes when engines are over-cylindered and the weight is badly distributed, with too much on the engine truck and too little on the drivers. Such are few, however. Again, when the engine is working at the shortest practicable cut-off, and is yet developing too much power, common sense tells us that steam must be throttled to suit the conditions of the work required.

Here we have four conditions under which late cut-offs and low initial pressure are advisable. Only the first, however, is of any importance—locomotives frequently start trains; but the condition of the rails is seldom such as to seriously affect the adhesion of properly designed engines; and such engines are not over-cylindered; and it is only in very light service, such as branch passenger and freight runs, that, with the right kind of a quadrant, steam must be throttled to keep down the power being developed.

Generally it is "nip and tuck" to make time, and the full power of the engine is being exercised. This being true, I think we may properly dismiss from consideration all but the first-named condition—starting trains—for it is plain that the others exist in but an insignificant measure compared to the average work of the average freight or passenger locomotive.

Aside from the conditions named, there is but one other condition of work wherein any necessity exists for using throttled steam with a properly designed locomotive. This is when more power is required to maintain the desired speed of the train than the engine is developing—say with a cut-off of 6 inches—and it is necessary to increase the length of admission of steam to the cylinders, and because of the crude arrangement for effecting that object—notches on the quadrant spaced $\frac{3}{4}$ inch apart—the required increased length of admission of steam (probably $\frac{1}{2}$ inch, or 1 inch), just sufficient to do the required work, cannot be effected; and instead, in advancing the reverse lever a notch, the length of admission is increased 2 or 3 inches—two or three times what it should be—to an 8 or a 9-inch cut-off. In consequence of which too much power will be developed, or too much of a draught will be made upon the steam producing capabilities of the boiler, or the action of the high-pressure exhaust on the fire will be such that an imperative necessity exists to *at once* partly close the throttle and wire-draw the steam down to a pressure at which the desired work can be done, and yet avoid these objectionable results.

Here then we have the "*imperative necessity*" for throttling and wire-drawing steam when a locomotive is doing its normal work. Is there another? There is not. And we have seen that the necessity exists only because the means of regulating the cut-off quadrants with notches wide apart *cause* it to exist.

And yet the committee tell us that the imperative necessity is the full explanation why locomotives are not equipped with close notched or finely divided quadrants. They might, with equal sense, have gone on and told us that the imperative necessity of men walking was the full explanation of their not being provided with wings, when we know that our not being provided with wings is the full explanation why the imperative necessity exists for us to walk.

However, I do not want to be disrespectful to the committee. I have no doubt that they were perfectly sincere, and reported according to the best light, or what was considered the best light they had. But I am sure it would pay many master mechanics to open their eyes afresh and take a new unprejudiced look at this question of the proper use of steam, and the conditions that affect it.

Referring, again, to the statement that throttling is common with some of "our best enginemen:" that is no proof at all that there is any good in the practice, but is only proof of the tenacity with which such men hang on to old methods, simply because they are used to them, or of their lack of correct information on matters pertaining to the economical management of their engines that should be the very A, B, C, of their occupation. Their reasons for so doing will seldom hold water, and are rarely of any more force than that given in the following true account:

While engaged on the C., B. & Q. a year ago, an instance came to my notice that I considered was one of the best possible practical illustrations of the difference it made in the coal consumption of a locomotive, whether its work was done for a whole month with short or late cut-offs, and the initial steam pressure regulated to suit the same. Engine 136, a 19 × 24 mogul passenger engine, of the class H of that company, was engaged during the month of August (1889) in pulling regular passenger trains between Galesburg and Ottumwa, always being on regular runs, and doubling the road every night. This engine had a double crew, two engineers and two firemen, that on alternate trips ran her. The engine was equipped with the C., B. & Q standard quadrant, which is a close notched or finely divided one, so much so, that the cut-off can be varied to very nearly just suit the work, as changing the position of the reverse lever from one notch to another increases or decreases the length of admission of steam to the cylinders only about 1 inch.

The two engineers in question differed in age materially, Mr. Potter being much the older, and Mr. Giddings much the younger man. Now, it happened that the engine was, in consequence of hard service, getting pretty well worn and loose, and that at very short cut-offs and high speed the rather high compression in the cylinders caused the cab windows to rattle badly, and indeed the cab itself, which was very annoying to Mr. Potter, and he took a very simple method of curing the trouble. He ran with late cut-offs 8 and 10 inches, and throttled his steam. The engine rode easier and the windows made less noise.

Mr. Giddings, being less nervous, ran the engine in his alternate turns with as short a cut-off as she would do the work with, from 4 to 6 inches, and gave her invariably a full throttle and let her rattle. At the end of the month their coal book (both men used the same one) showed a difference of over 30 tons of coal in favor of Mr. Giddings' method of short cut-off and full throttle.

From several trips I rode on the engine I could detect no difference in the methods of the two firemen, either in firing or feeding water to the boiler; and as the engine, with both crews, did the same work, pulling the same trains and number of cars over the same division, I thought it was a pretty clear case.

I give the correct names of the engineers, for Mr. Potter having a committee of the Master Mechanics' Association to back him up, will of course be free from criticism.

Engineering News says: "Experience seems to indicate that it is quite as economical to throttle as it is to cut off much below half stroke, or certainly one-third stroke." What experience? Any instance of a careful trial in locomotive practice? Many such instances as the foregoing have been published and many more could be, but I have never seen an instance of the other sort in print. If it is true it certainly ought to be made known, so that whoever is wrong may be corrected. GEORGE H. BAKER.

COLONIA, Uruguay, Oct. 8, 1890.

Proper Dimensions for Brick Arches.

ROANOKE, Va., Dec. 5, 1890.

Editor National Car and Locomotive Builder:

In this month's issue there is a query from Amos Jones asking for a rule to work by in designing brick arches for locomotives. It seems to me that this is a case where no hard and fast rule can ever be established, so much depends on the conditions and quality of fuel, *i. e.*, whether it makes large volumes of smoke and gas or burns more or less without smoke; whether it is a coking coal, clinging together on the grates, or one that will not adhere, and the small particles of which are easily torn from the grate; whether the coal burns better with a deep or shallow fire, or if it makes much light clinker which will adhere to the arch and gradually choke up the space between arch and grates if not removed. But I think that to obtain a starting point from which final improvements can be deduced after trial and careful watching, the following hints may be of service:

1. The front of the arch should be on a level with the bottom row of flues when possible, but it is absolutely necessary that there should be sufficient space under the arch in front for the proper depth of fire, and space enough over this for the fireman to conveniently throw on fresh fuel and for the gases to burn, otherwise a choked fire or bare spots on the grate bars will be the result, causing bad steaming and leaky flues.

2. The height of the back of the brick arch must be such that the firemen can conveniently throw the coal on to any part of the grate under it, without the coal striking the arch or going on top of it.

3. The area of the space between the back of the arch and the back sheet of the firebox should be a little greater than the flue area.

4. To ensure the free passage of the flame in its return to the flue sheet, the area of the space between the top edge of the arch and the crown sheet should be a little greater than that mentioned in No. 3.

5. It is absolutely necessary to have an open space of from 4 inches to 6 inches between the front edge of the arch and the flue sheet, so that ashes, dirt, coal and cinders, which may be thrown or carried by the draught on to the top of the arch can roll down on to the fire again, instead of into the bottom flues.

With these points carefully considered I think a fairly efficient brick arch can be put in any engine and afterwards modified a little as experience may prove to be beneficial. The question of using water tubes to support the bricks or of arching the bricks and supporting them from the sides is one that depends entirely on the quality of the water used. There is no doubt that on general principles the water tubes (well put in) and flat brick are more efficient and cheaper than the arched brick and studs, for the water circulation is certainly aided by these tubes and flat tiles are much cheaper than the arched brick; but with limestone water or any other water making a hard boiler scale these tubes are a failure. They cannot be kept well cleaned and the continual burned out and burst water tubes and delays to trains caused by them are an everlasting nuisance.

To experiment a little without going to the expense of making a special mold and waiting six weeks to two months each time a small change is found necessary, the following plan can be advantageously adopted, and was used several times very successfully when the supply of deflector bricks ran out. It is a Western idea, I believe. Take a piece or number of pieces of old scrap sheet iron,

corrugated or galvanized will answer, bend it into the shape of the arch, and wedge it in between the side sheets on the studs, or lay it on the water pipes; mix a ganister of broken fire brick and good fire clay, spread a good arch of this mixture on the sheet iron and build a slow fire under it, and let it bake very slowly. This can be done while other repairs are in progress. There is no occasion to re-remove the iron. It will burn away almost directly. Lastly, in designing a brick arch keep the pieces small enough to be readily passed through the fire door.

R. P. C. S.

The Right of a Man to Work when He wants to.

PITTSBURGH, Pa., Dec. 10, 1890.

Editor National Car and Locomotive Builder:

In the September number I noticed a communication entitled "The Right of a Man to Work when He wants to." I cannot agree with your correspondent regarding the necessity of curtailing the privileges of workingmen in regard to organized effort. "Reader" believes that licenses for engineers and conductors would be the one thing needful. Now, licenses could go no further than examining men in regard to rules and mechanical knowledge, and cramming previously would be resorted to as in other occupations where licensing is practiced now. That remedy would not make employés sober, prompt or reliable to a greater extent than at present. What has a license certificate to do with good judgment and horse sense? Nothing. In regard to "seniority," a senior man at least has a length of service to recommend him. It is merely carrying out the details of common sense and business principles, and prevents a great evil, namely, favoritism, something that parties that do not like seniority would like to put in force, to the detriment of the railroad service and the demoralization of the employés.

J. J. C.

Defending the Detroit Plan of Joint Inspection.

Editor National Car and Locomotive Builder:

Some one signed "J. C." has undertaken to answer "Progressionist" in December CAR AND LOCOMOTIVE BUILDER on the subject of "Joint Inspection." It is unfortunate that "J. C." appears to have practical knowledge of the Buffalo plan only, which may account for some of his statements, which would not need any attention if it were not that some others who are no better posted than himself might be misled by his statement.

The questions of dispatch and safety have been fully dealt with by "Progressionist." Of course the mixing up of foremen, inspectors and arbitrators in the way indicated by "J. C.," would not be good management, but as actually done in the Detroit plan is quite another thing, and very successful. It must be presumed that "J. C." refers to some interchange point where there is but one yard for all the roads to interchange in (Black Rock, N. Y., is a fair sample), where he speaks of two inspections. Of course at such a point the one inspection plan will work, but at most interchange points the inspection yards of the delivering and receiving roads are some distance apart, and the probability of cars being broken in the handling from the yard of the delivering road to that of the receiving road is fully as great as between terminals; hence the necessity of double inspection.

To illustrate the double inspection plan, also to give J. C. some light on the "cheap" idea of his, take for instance, Suspension Bridge, which is worked on the Buffalo plan; a train arrives from the east on the New York Central and is inspected in the N. Y. C. yard by the joint inspectors stationed in that yard. It is passed and the through cars are switched out and hauled over the river to the, say Michigan Central outbound yard; the probability is as great for defects to occur in the handling from the N. Y.C. to the M. C. yard as there is between Rochester and Suspension Bridge on the N. Y. C. The greater the haul between yards the greater the possibilities for damage. This is undeniable. Then is there not as much necessity for inspection for safety at M. C. R. yard as at the N. Y. C. yard at Suspension Bridge? According to J. C.'s theory there need be no inspection at the N. Y. C. Suspension Bridge yard, because there was a thorough inspection at Rochester six or eight hours away. By the joint inspection system in use at Suspension Bridge a set of joint inspectors are maintained in both the N. Y. C. and the M. C. yards referred to. These yards are some three or four miles apart, yet cars are inspected but once, and that before delivering. The receiving road, M. C., must take their chance of damage being done in the transfer of three or four miles, or of defects being overlooked in the first or only joint inspection, unless they maintain an outbound inspection at their own cost.

J. C. has an erroneous idea that the "Detroit plan" maintains two sets of inspectors in each yard, one for inbound and one for outbound cars. This is a mistake; the one set of men inspect both ways; as a rule, it takes no more men.

If J. C. had read the November article carefully he would have noticed that the chief joint inspector or arbitrator, by the Detroit plan, has full control of the joint inspection, dictates how it shall be done, also decides all disputes. Where is the chance for sharp practice? There is extra vigilance in the second inspection in order to detect anything that has been overlooked in the first inspection. It might also be said that the first inspectors are sharp and vigilant in order to let nothing pass them for the second inspectors to detect, as they know full well that if the second inspectors do find anything against them that the road of the first inspection will have to pay the bill for repairs, as no cars are sent back when the repairs can be done under load. This is where the dispatch and safety comes in. There are no delays, as J. C. fears, because the inspectors are just as well schooled in joint inspection by the Detroit plan as by the Buffalo plan.

The latter part of J. C.'s letter advocates the Czar, or infallible plan (which is not American), and has no connection with the Detroit plan.

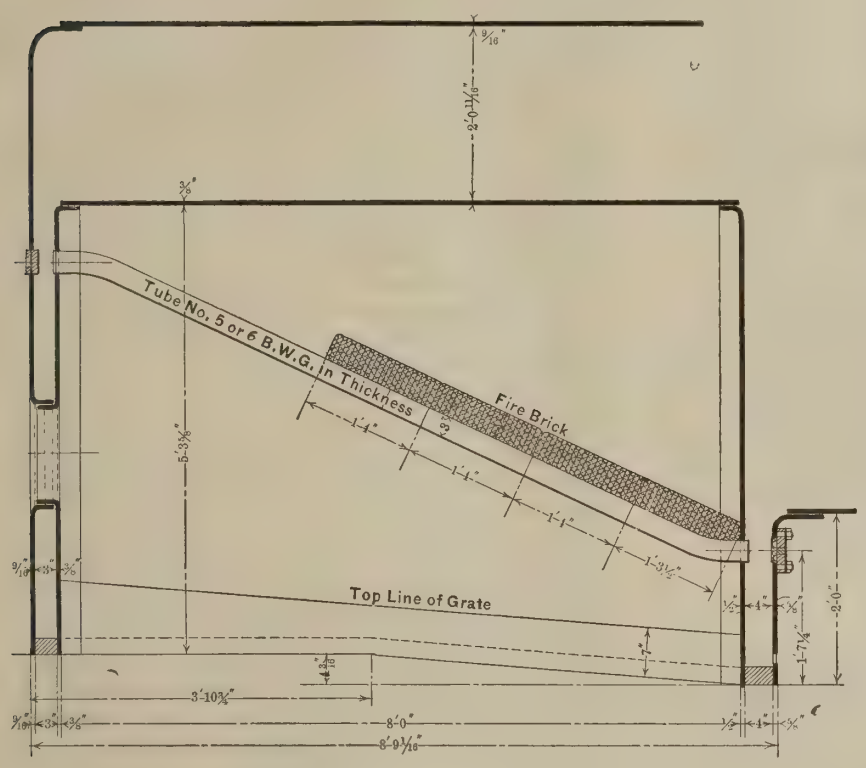
Finally, for the information of J. C. or any who may be misled with similar ideas. The Detroit plan stands on its merits. When it was established the Buffalo plan was not giving satisfaction, hence the roads at Detroit, believing in the saying that there is always room for improvement, instituted the so-called Detroit plan, and they are perfectly satisfied with it. More than this, the Central Railway Club at their May, 1890, meeting passed a resolution recommending the Detroit plan as the best.

P.

An eminent scientist lately lectured in New York on coal. He said that for a time England was the great coal-producing country of the world, but since America has entered the field in this industry the United States holds first place in the great coal reservoirs of the earth. The total area of the coal producing districts of England is only 12,000 square miles, whereas that of the United States is 120,000 square miles, or ten times as much.

Method of Supporting the Brick Arch.

We have several times lately received requests for information respecting the best methods of supporting brick arches in locomotive fire boxes, and in response to these requests we illustrate in the annexed cuts the arrangement in use on the Union Pacific. As will be seen, three water tubes are employed to carry the arches on this road. When the Union Pacific can successfully use water tubes with the great diversity of bad feed water that is found on the system no other railroad company ought to have any difficulty in employing them without accident. The only argument that has been urged against the water tube for this purpose is that it is liable to burn out and cause dangerous explosions. If it is kept clean and removed when it begins to get warm, then there is no danger with a tube. It will be seen that good means is provided for cleaning out the tubes every time an engine is washed out. The tube is held in place by being expanded like an ordinary flue and an opening sufficiently large for getting at the end of it conveniently is provided, the opening being closed by a steam-tight circular plate of the form and dimensions shown in the cut.



A Pullman conductor, after long years of service, epitomizes his career as follows: Pleasure received, some; insults from superior officers, many; money, none; gratuitous insults from passengers with hoggish natures, several thousand; worldly knowledge, much.

The Virginia Car Co. has been incorporated, at Buena Vista, Va., with A. S. Buford, of Richmond, as president; F. H. Foster, of Glasgow, vice-president, and Charles Conway, of Richmond, secretary, to build car works. The capital stock is to be from $100,000 to $1,000,000.

In the Gruson Works, Madeburg, Germany, they have two traveling cranes, each of 150 tons capacity. They are the largest traveling cranes in the world. The crane is a plain truss girder with each end resting on pillars which are carried by eight trucks that run on tracks even with the floor of the shop.

The development of chilled castings was due to the experience of Americans with chilled wheels, but the engineers of other countries have greatly extended this method of putting an intensely hard surface on cast iron. In Germany they make chilled cast iron turrets about 100 tons weight for covering guns in land defences.

The question of motive power on street railways is one chiefly of cost; the speed is regulated by the danger. Overhead electric lines are desired for their cheapness, not for any other quality. The real question is whether a city shall have its streets and roads disfigured and made more or less dangerous to accommodate railway companies with a cheap motive power, or whether it shall insist upon a less objectionable motive power (storage batteries), that may cost the companies a little more, but will serve the same ends so far as the public is concerned. That is the whole question in a nutshell. Everything that a surface road can do for the public if run by overhead electric wires can be done by surface roads run by cable, by storage batteries, by steam, or by compressed air. The only question is that of cost, and the railway companies prefer the cheap way, even though it should create a public nuisance.

Cushioned Carrier Iron Bracket for Draw Bars of all Types and Makes.

The engraving herewith shows a general plan of a new and valuable invention in carrier irons combining several valuable features, consisting as follows:

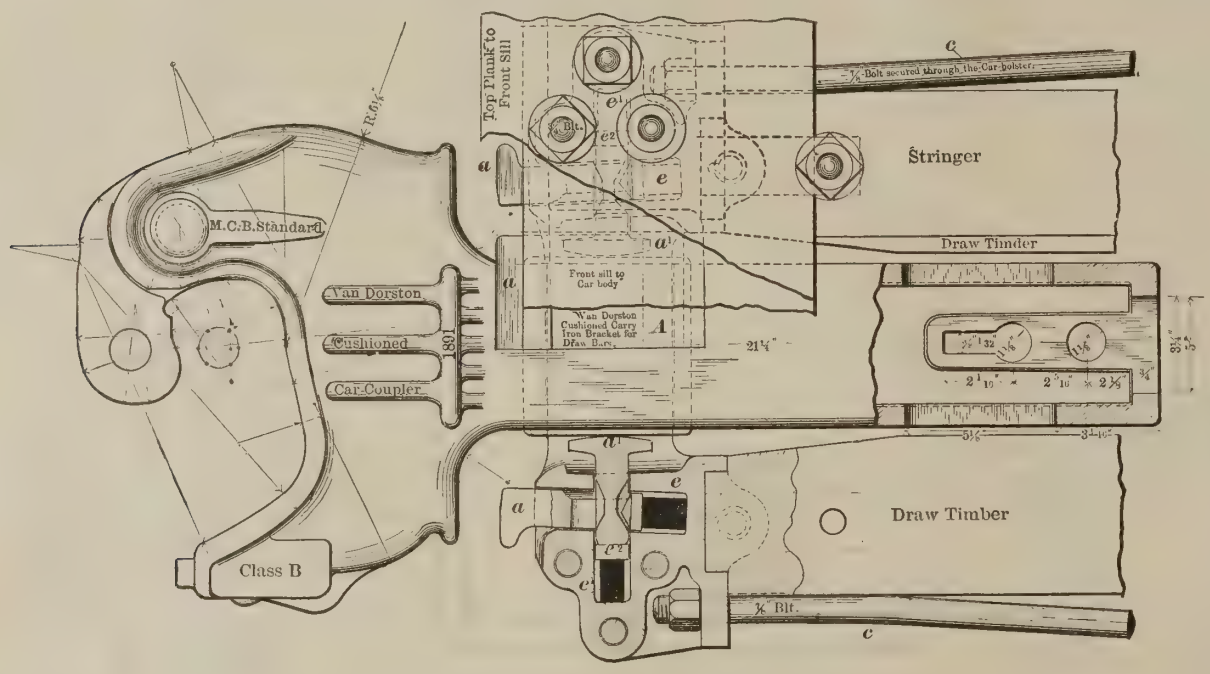
First—To provide a carrier iron bracket, *A*, that will withstand heavy freight service without becoming worn or damaged, as the parts that are exposed to wear are removable, and can be replaced without the removal of the bracket proper.

Second—To do away with the dead blocks entirely and provide a cushioned medium capable of 300,000 pounds, resistance, without injury to the bracket, the draw-gear, the couplers or car bodies.

Third—To allow the couplers to move laterally ¾ of an inch either way, a total of 1½ inches when the side pressure demands it, and when relieved the bars are thrown to the center of the brackets, leaving ¼ inch free slack at each side as required by the M. C. B. carrier irons. Thus it will be seen that this device enters into the solution of the rigid and swing beam truck discussion as a welcome Moses from the wilderness.

In its application to the car sill four or six ¾-inch bolts may be used, and the bracket may be set flush with the front face of the sill, or may be set back from 2 to 3 inches, if desired, without injury to the sill whatever.

The buffers, *a a a*, have a resisting capacity of 100,000 pounds each in a travel of ⅝ inch, and occurring upon three



sides of the bar head at the same time. The inner transverse buffers, *a' a'*, serving as the side chafe plates to the bar, and yielding laterally to suit the curve work upon all curves down to a radius of 100 feet. However, a greater motion can be attained if found necessary.

The value of the invention further includes the merits of protecting couplers alike, whether they are closed or open when coming together, which is not the case with dead blocks if the knuckles are in a closed position. Aside from the above advantages in going around curve work with the same freadom of the old link system, it will be observed that there are no dead blocks to prevent the couplers from coupling by their coming in contact with each other before the couplers are allowed to meet and make the connection. A thorough test of this device will be made in the near future, and a general invitation given to railway officials to witness the operation of this new invention claimed to be the missing link necessary to the success of the M. C. B. couplers, after which it will be put on the market by the Van Dorston Car Coupler Company at the lowest possible rates.

Making Bricks Without Straw.

You do not have to go very far or hunt very long now-a-days to find a master mechanic or machine shop foreman kicking about the quality of mechanics, and bewailing the fact that "machinists ain't what they used to be."

Motive power officials are themselves wholly at fault for the lack of good railroad mechanics and for the hordes of useless ones. This is a broad statement, but it is true, nevertheless. A look around a railroad shop is enough to convince any one.

Good mechanics are in constant demand now—first-class machinists are worth $3.50 and blacksmiths $4 per day—yet there is no supply for the demand. Botch workmen are plenty, and dear at any price.

In order to make first-class mechanics it is necessary to have, as seed, apprentices of intelligence, with common school educations, a taste for mechanics and an ambition to become proficient in the business. With this kind of material to begin with, time, opportunity and experience will produce a first-class mechanic—just as a little attention in the right line produces a chick from a good egg; time, attention, opportunity nor anything else ever made anything of a bad egg—except a worse egg.

Show us a railroad shop where they try to select good material for apprentices; it is not done in one case in a hundred. Let the average youth, say 18 years of age, go to an M. M. or shop foreman, seeking an opening for a chance to learn the machinist or blacksmith trade, or to get a job firing, and what encouragement does he get?

In the first place he is too old, says his judge, don't want no schoolboys anyway, and, if the applicant has pride enough about his personal appearance to wear a clean collar, he is put down as a "dude."

The very youths who would make bright and useful mechanics are shut out from a field of usefulness that they would honor and adorn—for what?

To give room for boys who go into the shops for the bare wages in sight, or because they are forced there by their fathers, who are in the service some place, or have some influence with "the powers that be."

Mickey Doyle is the oldest wiper on the road, hasn't missed a day for nine years, he wants to get his boy Dennis doing something to help support him, as he won't go to school, so he makes application early and the boy is worked in as helper, serves three years as an apprentice—just as he would serve three years as a prisoner—and turns out as a machinist; he don't go to work as a jour, in the shop. No, the foreman can't put on any full pay men, just then; so he goes off, a finished mechanic, and the master mechanic or foreman is glad to be rid of him.

If possible, Dennis is got on the road firing—pays more on the start—he is given a job cleaning ashpans or wiping, the foreman mentally declaring that he knows enough for that, and that's about all; but a rush occurs, and the first available man is pressed into service, so Dennis gets to be smoke shoveler, and, as the agreement with the men says seniority is the proper qualification for promotion, Dennis gets an engine in his turn. One more plug engineer added to the list of bad ones, and another young man, who would have made a good one, forced to drive horse car, tend bar, or go into politics.

The railroad officers are complaining about the quality of engineers and mechanics, and are themselves making poor ones all the time. It would take some work, a little thought, and a departure from precedent, to choose apprentices for all positions upon the merits of each case, to give intelligence, natural aptitude and decency preference over cousinship, friendship, politics, religion or boodle.

Anything will do for a wiper or a helper, and after the wiper or helper has been pushed up to promotion, his own maker will complain of the bricks without straw on hand, and blame the brick—instead of blaming the maker.

If a boy wants to drive a canal boat and his father wants him to be a machinist and forces him into a shop, the parent stands just as much show of making a good mechanic of his boy as he would of making his daughter happy by marrying her to the man of *his* choice and murdering the man of *her* choice.

When those who have the making of mechanics will seek to improve the quality by selecting good timber and keeping up a constant inspection for "culls," instead of employing in subordinate positions those who are forced upon him, or who are the least trouble to get, we will have a better crop of machinists and engineers, and not till then.

We have no patience with that class of pessimists who are constantly declaring that good, bright boys don't want to learn trades. Once announce that you will put to work only intelligent young men who have gone through the public schools, and who themselves desire to learn the trade, and who will, after six months' trial, satisfy you of their adaptability, and desire to become mechanics, and that they will be promoted on merit, and you will be overrun with applications, and can pick out the future mechanics of your road from the cream of the land.

There is a crying need for good mechanics, the brightest boys in the land are anxious to become such, and there is room for them. Why don't they get the chance? Is it because of the inability of American shop foremen to tell good material from bad? Is it because they want poor mechanics, so that they can be whales among toads? Is it because they are apathetic, and do things the easiest way? Or, is it because they are themselves the wrong men in the wrong places, promoted on account of the date they hired to the road, instead of what they know about their business or the selection and management of men?—*Locomotive Engineer.*

A few of the leading locomotive builders have sent us notes of their output of locomotives during the past year. The following are the total numbers built: Baldwin's, 953; Cooke's, 82; Norfolk & Western, 36; Pittsburgh, 125; Schenectady, 335.

The new passenger car invented and patented by Mr. L. P. Farmer, late General Passenger Agent of the New York, Lake Erie & Western Railroad, and now Passenger Commissioner of the Trunk Line Association, is entered through double doors at the centre, with the door sill just above the level of the station platform and the steps wholly within the car. Doors for passage through the train only are provided at the ends of the car. The advantages are obvious. With the doors in the centre (which is the position of the doors of the cars running over the Brooklyn Bridge) the cars can be more quickly emptied, which is an important factor on heavy local trains desiring to make quick time. It will not be possible for passengers to get on or off while the train is in motion. The cars are closely coupled and riding on the platforms will not be possible. Special provision is made for shutting off drafts of air by use of centre doors.

The great anthracite coal industry which is the source of so much employment and wealth is of comparatively recent origin. For many years after the mining and transportation of bituminous coal had become an important industry, the value of anthracite remained unknown, and those who happened to find pieces of this coal considered it merely a curious rock. In 1820 a hunter found some fragments of anthracite in the Lehigh Valley region near Mauch Chunk. He thought it was a strange thing, and his inquiries concerning it resulted in the discovery that it was anthracite coal on the surface of the earth. A company was formed, the coal was mined, and the product was floated to Philadelphia. The attempt to use it for fuel resulted in the verdict that is was only fit to put out a fire. The people of the United States had been accustomed to soft coal, and had neither grates nor other appliances for the proper use of anthracite coal, which now stands first among the coal fuels of the world.

The steam engineering department of the Brooklyn Navy Yard last month tested two blower engines received from the Buffalo Forge Company. The two blowers, if satisfactory, are to be fitted to the corvette "Galena." They will supply forced draught to the furnaces, a plan that makes marine boilers about as rapid steam makers as the boilers of railroad locomotives. The Government test requires that the blower shall develop 10,000 cubic feet of air on an air pressure of 2 inches of water. The blowers came up to the requirements in 575 revolutions per minute. The contract provides that the blowers shall be able to make 800 revolutions per minute. They demonstrated this ability. The contract further requires that during the seven hours' test the oil cups shall not require refilling. The draft furnished during the test showed a velocity of 70 miles an hour. An electric counter, the invention of Past Assistant Engineer Weaver, was in use to measure the number of revolutions. The use of forced draft aboard the "Galena" will enable the corvette to maintain her present steaming efficiency on a less number of boilers.

A young man with every mark of rustic simplicity upon him applied lately at a busy interchange point for a job as switchman. The yard master asked if the applicant had any experience in switching cars, and was answered in the negative, but the rustic was decidedly positive that he could couple cars successfully. "Well, let us see what you can do," said the yard master, signaling the engineer to go ahead, and then bring him back sharply. The youth made the coupling like a veteran. Another trial was made, and the engineer was instructed to move lively, but the new switchman had no difficulty in connecting the cars. A third trial was made, and the cars were crashed together with velocity sufficient to break up the draft rigging, but the applicant for a switchman's position slipped out smiling after making the coupling. Then the yard master yelled out,

You do not mean to tell me that you never coupled cars before?" "Never," said the rustic. "Well, how in thunder did you learn to do the work?" "I was for six months attendant of Alcantara," answered the new switchman modestly.

Mr. N. P. Cowell, of Cleveland, O., has invented and patented a new vestibule car on quite a different plan from any now in use. We understand that it is convertible from a vestibule into an open car, or vice versa, at will. It will cost not more than one-half as much as the Pullman. It is pronounced by all railroad men, who have examined the drawings, as a very ingenious, and entirely practical improvement—and fully the equal of the Pullman as a luxurious car. It is claimed for this device that it weighs one-half less than the Pullman vestibule.

The Glidden Varnish Company, of Cleveland, Ohio, who have made such a success with their varnish during the past few years, have just added to their already large plant a building 100 feet long by 25 feet wide and two stories high, which will be used exclusively for the manufacture of their finest grades of railway varnishes.

Pedrick & Ayer, Philadelphia, have published a very handsome and finely illustrated catalogue of their Universal milling machines, portable and stationary cylinder boring machines, Richards' open side planer and their other machine specialties for doing work in railroad shops. Special attention has been directed to showing the work that can be done with the open side planer. Master mechanics and car-builders will find the catalogue a useful reference.

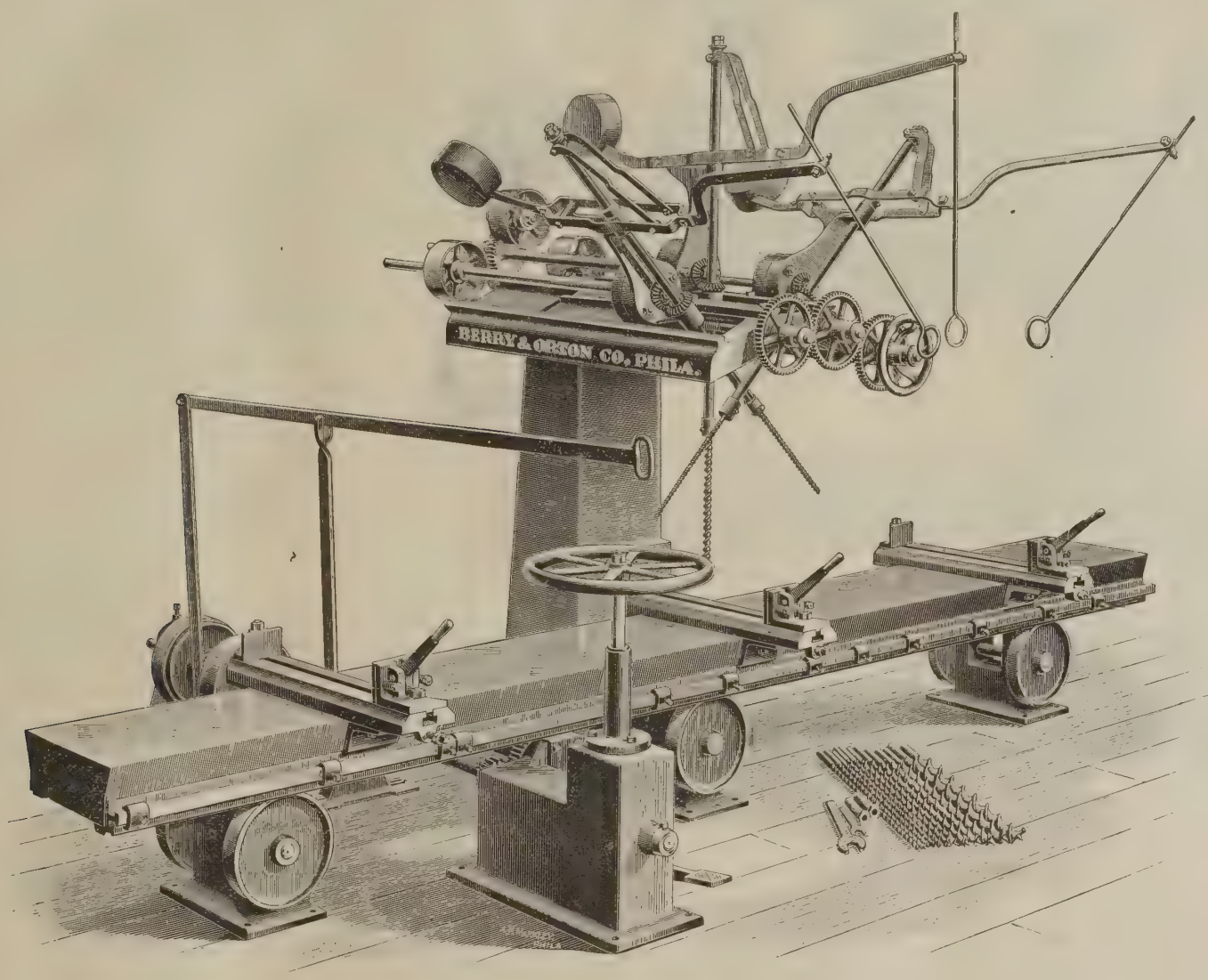
Three-Spindle Universal Vertical Boring Machine.

The Berry & Orton Company's boring machine, which we illustrate herewith, is one of their latest, and designed especially for use in car shops, or other heavy work where holes are to be bored either at an angle or square from the surface of the timber.

The three boring spindles have each a movement of 24 inches across the table and a vertical one of 18 inches, and can be set at an angle of 45 degrees or less. Each spindle, any combination of two, or all three can be moved at once across the table by means of the hard wheel shown in part.

Each spindle has a quick-return, and is strongly driven by a 4-inch belt through a pulley 8 inches diameter, which gives abundance of power for driving the largest augers through the hardest kinds of wood.

The table is made of glued up strips of wood, veneered both on bottom and top with hard Southern pine 1¼ inches thick, made of any length required, is fitted on the edge with a number of stops for duplicating work without the expense of laying out; also on the top with a system of bolsters and clamps that take in 24 inches in width to receive and secure the timber to bebored. The whole is mounted on a system of rolls 12 inches diameter, placed about three feet apart, on which it is readily moved either by hand or power through the feed stand and shifting bar, clearly shown in the illustration.



Three or four car sills or plates can be placed on the table at once and moved by power forward and back at the rate of 200 feet per minute, or moved by the hand wheel to the finest adjustment. There is one of those machines in operation, with a table 75 feet long; the usual length for freight car work is 40-feet, and for short work is 14 feet. The total weight, with a 14-foot table, is about 5,000 pounds.

Each machine is fitted with a countershaft, sixteen auger bits of assorted sizes, and a full set of forged steel wrenches.

For further particulars address Berry & Orton Company, Thirty-second street, above Arch, Philadelphia, Pa.

A Palace Street Car.

The Short Electric Railway Company of Cleveland is either burdened with funds that they spend recklessly or they expect to keep passengers on the road a long time to judge from the style of car they have lately put upon the road.

This car is 26 feet in length, the vestibules being four feet each and the body of the car 18. The vestibules are finished in silver. The interior is equal if not superior to any similar car in the world. The general finish is in old brass. The curtains, hangings and carpet are old blue, with mahogany and leather trimmings. The ceiling is faced with leather, studded with fancy tacks, and the carving on the window panels and sides of the car is very rich. The chairs are really luxurious, being of willow, handsomely upholstered. It runs as lightly as a phaeton, and it is altogether absolutely perfect in all its appointments. The electroliers are from Archer, Pancoast & Co., and are of special design and very handsome workmanship. The car was built by the Gilbert Car Co., of Troy, N. Y., and the motor by the Brill Car Co., of Philadelphia, Pa. The cost of the car was $10,000.

We have to acknowledge the receipt of a neat diary and engagement book annually sent to their friends by Drake & Wiers of Cleveland, the well-known manufacturers of asphalt car roofing.

The Railway Lighting and Manufacturing Company, of Philadelphia, Pa., have their Carburetor system of lighting railway cars on 34 different roads, and have equipped since Feb. 1 upward of 1,000 passenger cars with it.

A. B. Burtis, Ben Patterson, W. Sargent, Jr., F. B. Stevens and R. C. Hopkins announce that they have commenced the manufacture of high grade paints and colors for railway use. The address of the new firm is The Arcade, Cleveland, O.

The Boyden Brake Company, of Baltimore, Md., are pushing their brake with considerable success. It is now in use on forty-five roads. They have just received orders from the Cincinnati, Sandusky & Cleveland, and the Jacksonville & Southeastern railroads.

All the cars of the Royal Blue Line (Baltimore & Ohio Railroad) are equipped with the Stier dust guard, manufactured by Messrs. Rentor & Mallory, of Baltimore, Md. They are shipping quite a number of these dust guards to railways in England and Germany.

The American Steel Car Wheel Company, of Boston, Mass., have received a large order for wheels to be sent to Peru to be used in the mountain service there; also an order for small wheels to be used on heavy ore cars for special service on the Rocky Mountains.

The Erie Car Heating Company, of Erie, Pa., have several trains on different roads heated with their system. Their couplings are so constructed that it is next to impossible for the steam to leak out, so that sufficient pressure can be used to enable them to heat the rear car of a long train to the temperature of the others.

The Eureka Tempered Copper Company, of North East, Pa., were awarded the John Scott medal by the Franklin Institute of Philadelphia at the November meeting. The company reports large orders received for their goods for electrical purposes and for bearings, and have been compelled to double the capacity of their plant recently.

Messrs. Hills & Jones, of Wilmington, Del., machinists, have recently added an extension 153 by 70 feet to their already large shops, so as to have facilities for keeping up with their orders. They are using a 20-ton traveling crane and other labor-saving devices. Among the tools they are using is a planer, 10 feet wide, 7 feet high, and 20 feet long.

Leslie Bros. & Co., builders of the Rotary snow plow at Paterson, N. J., have built ten of their plows so far this season; three of them have been sent to the Union Pacific Railroad, which will make nine in use on that road. The fact of one road using nine Rotary snow plows is evidence that they do the work and do it so well that the old time push plows and armies of shovelers are things of the past on that road.

Byram & Co., exclusive manufacturers of the Colliau cupola furnace, have recently executed a contract for the *second* Colliau cupola furnace for the United States Government, to be erected at the Watervliet Arsenal, West Troy, N. Y.

The same company recently shipped two of their 63-inch cupolas to the Pike Manufacturing Company, Pell City, Ala., and two of the same size to the Geo. F. Blake Manufacturing Company, East Cambridge, Mass.

Watson & Stillman, New York, have issued an illustrated pamphlet showing the various forms of jacks and other machinery manufactured by the firm. The list embraces hydraulic jacks and punches, hydraulic presses, pumps and fittings, lever and screw punches and shears and a variety of polishing and buffing machinery. Those who have to use any kind of jack will find this pamphlet very useful. It contains much interesting information about hydraulic jacks, and forms a good handbook on them.

Every railroad man who has anything to do with the cutting of rails to make them fit the track on curves, and a places where full length cannot be used is ready to acknowledge the merits of Smith's portable rail saw. We have recently received a copy of a circular containing testimonials from prominent engineers and railroad superintendents respecting the convenience of this machine. In addition to rail cutting the machine can be used for cutting bars of steel and iron in shops where they have no other tools suited for that work.

The Safety Car Heating and Lighting Company, New York, have done a thing which will be a great aid in making popular the systems of car heating and lighting controlled by the company. They have prepared a neat handbook, which slips into the vest pocket, and contains full information about the handling of the apparatus used. This book is given to all the trainmen who have to care for the Pintsch system of lighting or the Standard system of steam heating. The directions are given in simple language, and there is no excuse left for trainmen failing to give the apparatus the necessary care.

Those who are using Eureka tempered copper for car and locomotive bearings testify cordially about the service. The company recently said: "One of our tempered copper boxes was placed in the service of the Pennsylvania Railroad Company between Kane and Renovo under tender of engine No. 2,020, March 21, 1887, and taken out October 30, 1888, having made 96,347 miles. Box was in good condition and showed but little wear. Another was placed in same service between Kane and Erie, Pa., and used over two years, and was taken off in good condition, showing no lateral wear and but little wear upon its face, having made 155,000 miles."

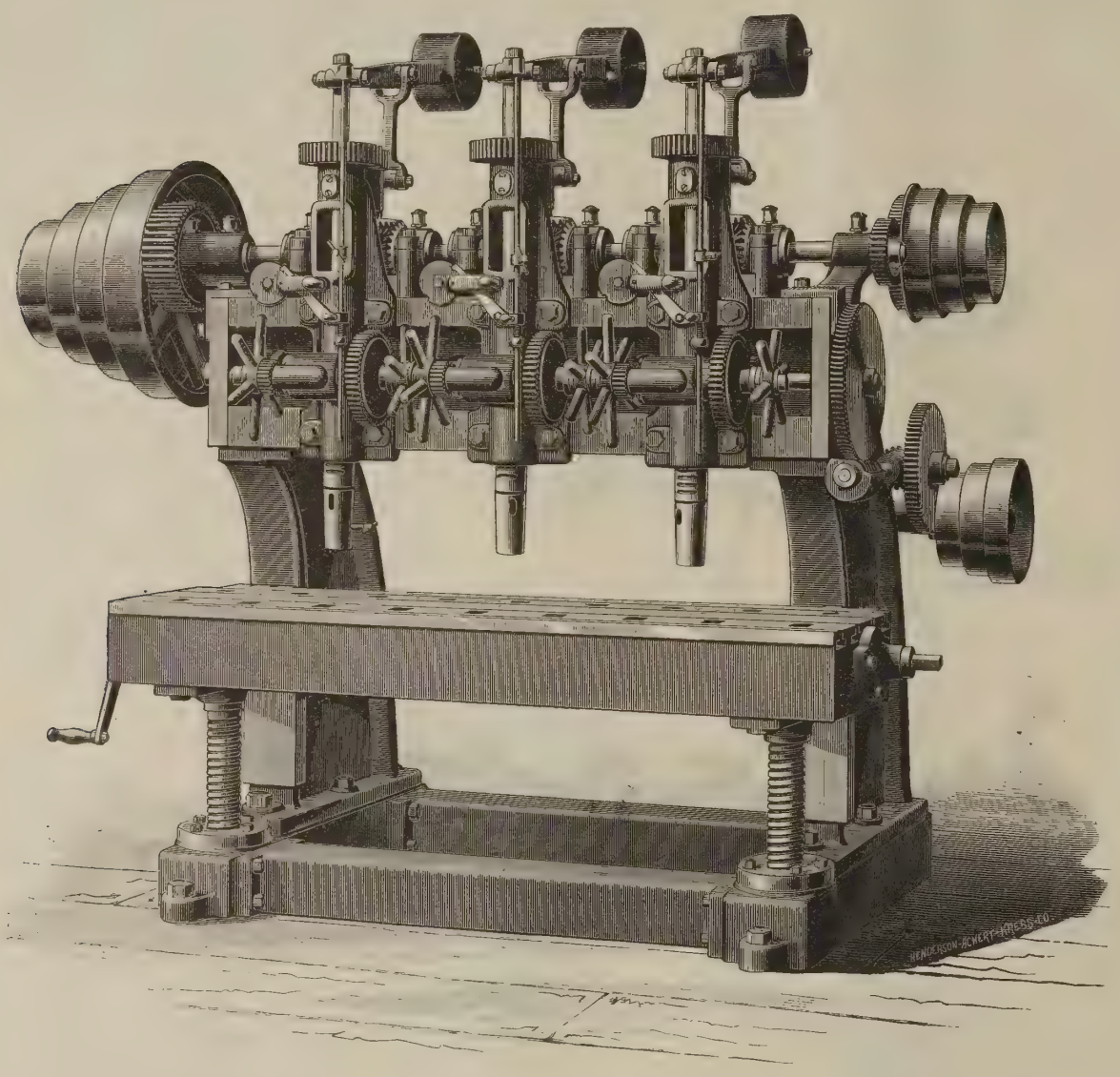
Mr. W. B. Mack, inventor of the well-known Mack injector has recently effected an improvement on the instrument that will make this boiler feeder much more convenient in regions where the feed water is impregnated with lime and other incrusting impurities. It is well known that the solid ingredients present in feed water are to a great extent precipitated by heat, and the effect of this is that they are deposited on the inside of injectors forming a crust which soon destroys the efficiency of the instrument. The only remedy is to remove the interior tubes and clean them. The improvement designed by Mr. Mack consists of connecting the inner tubes by a plain cylindrical fit which is held together by means of a key. When this key is removed the tubes can be drawn apart without the least difficulty. The change will enable a man to examine the injector in a few minutes.

Multiple Drilling and Tapping Machine.

The accompanying illustration represents a new multiple drilling and tapping machine recently brought out by the Niles Tool Works, of Hamilton, O.

As will be seen from the cut, the machine is very rigidly strongly and compactly built, and is admirably adapted to the work for which it was designed. It has three large spindles fixed on a heavy cross-rail, and placed 18 inches apart. Each spindle is independent in its action, and has independent reversing gear and power feed. The method of reversing the spindle is as follows:

The hand crank shown in front of each spindle, at the top of the rail, operates a clutch between box bevels on the driving shaft. To this handle is attached a balance weight, leading away from the machine. Tappets on the vertical rod



in front of the spindle are adjustable to disengage a pawl from the hand reversing lever when the taps or drills have reached the desired depth. This permits the balance weight to act; it immediately disconnects the clutch from the driving gear and the spindle stops.

In drilling there is a quick return by means of the pilot wheel and gears shown; in tapping, the hand crank is simply reversed and the spindle backs the tap out itself.

The table is supported on two heavy screws, connected by bevel gears, and also firmly gibbed to the housings. It can be raised or lowered from either end, and has a vertical range of 18 inches, thus giving sufficient adjustment for all ranges of work within the capacity of the drill.

A powerful feed, with three changes, is provided, which is independent for each spindle. It is connected and disconnected by means of a friction clutch operated by the hand-wheel shown on the right hand side of each of the spindles.

The machine is strongly driven and geared, and the driving power is sufficient to carry three 1½ inch pipe taps at one time.

From this description it will be seen that the machine is well adapted to drilling and tapping such work as cylinders and heads, valve chests, steam and water valves, governors, couplings, flanges and all such kindred work.

Tobin bronze manufactured by the Ansonia Brass and Copper Co., of New York, is meeting marked success for such purposes as bolt forgings, pump piston rods, and pump linings, and is largely used by the leading marine engine and pump builders of the United States as well as by the railroad companies that own steamers and tug boats.

A most successful test was made of the Norwood Car Replacer, upon the tracks of the B. & O. Railroad Company at Baltimore, under the supervision of the officials of that road, in November last. A gondola car loaded with paving blocks and weighing 95,000 pounds was derailed at the point of a slight curve, which had a tendency to slew the trucks from the rails. The extension or guard rails, only to be found in the Norwood, was then explained, and its merits freely commented upon. The replacers being in position, signal was given the engineer to go ahead, and the wheels rose on the replacers and from them to the tracks as easily as though passing through a switch. No jar or sudden drop is made when the wheels leave the replacers for the track, as the rise is only great enough to allow the flange to clear the top of the rail.

Big Order for Freight Cars.

The Reading Railroad Company has just contracted with the Pullman Car Company for 3,000 30-ton coal cars, 1,000 gondolas, 1,000 box cars and 50 stock cars. The delivery is to begin about the first of next year. About 1,000 are to be delivered by Feb. 1, and the remaining 4,050 by Aug. 1. This addition to the company's rolling stock will necessitate an expenditure of over $2,500,000. With the 4,500 new cars added last year, those contracted for will give the road an equipment unexcelled by that of any railroad in any country.

These cars, like the 4,500 built last year, will all be equipped with the Van Dorston automatic couplers and Westinghouse air brakes. The management of the Reading deserve credit for the progressive spirit that prompts them to keep abreast of the age in the matter of the use of safety appliances. They have gone to a very heavy expense in equipping these 9,550 cars with the automatic couplers, and the couplers upon the 5,050 cars just contracted for will cost $126,500, while the air brakes will cost even more than that sum.

This heavy outlay, mainly designed as a safeguard for the lives and limbs of the company's employés, will also largely benefit the company itself by facilitating the discharge of business as a freight carrier and by saving losses of thousands of dollars from wrecks which these appliances will in a large measure prevent. The company might, perhaps, have equipped these cars with other makes of brakes and couplers for a less generous outlay of cash, but the wise foresight of their managers and the heads of their mechanical departments have led them to take this course, which in the end will prove true economy.

The Union Coupler Company, of Philadelphia, are starting out well with their car coupler, having equipped 275 cars of the Pennsylvania, Poughkeepsie & Boston railroad, and have several other orders on hand.

There is no better evidence desired that it pays to use superior machinery than the fact of the Egan Company, of Cincinnati, Ohio, having such an enormous demand for their recent productions, not alone from this country, but heavily from abroad. Experts everywhere realize by experience that this celebrated company are the originators of unsurpassed mechanisms to reduce the cost of manufacture, and to increase capacity.

The Dixon Crucible Company write us: The year 1890, as we predicted twelve months ago, has brought a greater volume of business than for any previous year. While sales have increased, prices have also declined which means proportionately, a greater quantity of goods. Our output has taxed all the facilities we have, and in 1891 we must tear down and build greater. Competition has never been so active. Some of it never was so foolish. Cut prices, when they approach and go below cost, mean lack of business brains. In such competitions cut prices are the weak resources of the incompetent. The outlook for 1891 we think is good, except as it may be qualified by timidity born of the present financial troubles. Successful business every year ceases more and more to be a walk over, and the Darwinian law, the "survival of the fittest," is to be the law of the future in business as well as in nature.

To Prevent Drawbars Uncoupling on the Road.

Mr. McEntee, inventor of the car coupler bearing his name, writes us about the coupler: It is the only automatic coupler ever invented which if no better than the common draft iron is certainly as good. I claim that I have discovered the cause for the throwing out or pulling out of the pin from the drawbar, and that I have applied the proper remedy.

My theory as to this is that a high drawbar will pull a pin out of a lower one while passing over uneven track when the pin does not work freely in the drawbar, for the reason that the pin being in right angles to the plain of the drawbar, the pull coming from a higher drawbar has a tendency to lift the pin in the opposite drawbar, and the link on becoming slack drops quicker than the pin and gets a fresh hold. This process is repeated until the link has room to pass partly under the bottom of the pin, when on receiving a sudden jerk the pin is thrown out of the drawbar and the train is broken in two. I prevent this by inclining the head of the pin backward so that in the lower drawbar the pin will stand at a right angle with the line of draft instead of right angles with the plum of drawbar. There is one other way by which a pin is thrown out of the drawbar; it usually happens when the drawheads come together in a sag. The top of the drawheads first coming in contact, which points are above the point of the bearings on the springs, the shock causes the drawbars to rebound from the carrier iron and fly upward to the sill, when the stop comes; then the lower parts of the drawheads are in contact; then the drawbars are forced downward by the leverage of the stop from above the bearings of the points of contact below. The pin, if working freely in the drawhead, is not compelled to go downward with the drawhead, but it continues on its upper course in obedience to the force which first threw the drawheads upward. To remedy this defect I remove the stop from the top of the draft iron to the sides. I also use an incline on the top draft iron, which acting on an angle iron plate on the under side of the sill of the car will prevent the upward and downward motion of the drawbar by forcing the draft iron gradually downward to the carrier iron as it is driven inward.

The Pullman Balance Sash Company, of Rochester, N. Y., report a growing demand for their sash for car windows. They recently received a single order for 500 pairs. Among the railroad companies that have lately applied this sash to their cars are the Lehigh Valley, Boston and Albany, Kansas City, Fort Scott & Memphis, and the Pennsylvania.

Our Directory.

We note the following changes during last month:

Beech Creek.—J. D. Layng has been appointed general manager of this company in place of Gen. George J. Magee, resigned.

Boston River, Beach & Lynn.—M. Shepard Bolles has been elected president.

Central of Georgia.—F. H. McGee, master mechanic of the shops in Savannah, Ga., has been appointed master mechanic of the shops in Macon, Ga. Oscar Antz has been appointed master mechanic at Savannah in place of McGee.

Central New England & Western.—S. B. Opdyke, Jr., general superintendent, has resigned that position.

Chicago, Burlington & Quincy.—H. D. Judson has been appointed superintendent of the Chicago Division at Aurora, Ill., vice L. E. Johnson. Phillip Wallis has been appointed master mechanic at Creston, Ia., vice C. W. Eckerson transferred to Beardstown, Ill.

Chicago & Eastern Illinois.—M. S. Connors has been appointed general superintendent.

Cincinnati, Sandusky & Cleveland.—On Dec. 1 the duties of purchasing agent were assumed by J. H. Garaghty, purchating agent of the Big Four.

Cleveland, Cincinnati, Chicago & St. Louis.—F. P. Boatman has been appointed superintendent of motive power.

Columbus, Shawnee & Hocking.—H. O. Pond has been appointed superintendent.

Des Moines & Northwestern.—George W. Ogilvie, Superintendent, has resigned.

Eastern of Minnesota.—W. S. Alexander to be vice president and general manager.

East Tenn., Va. & Ga.—S. M. Felton, Jr., has been elected president succeeding Samuel Thomas.

Illinois Central.—J. C. Hartigan appointed superintendent northern division, vice E. G. Russel transferred to Wisconsin division.

Louisville & Nashville.—William P. Pike has been appointed division superintendent, with headquarters at Louisville, Ky., in place of P. T. Downs, resigned. J. G. Clifford; division master mechanic at Mobile, Ala., has been appointed division master mechanic at Louisville, in place of W. P. Pike, promoted.

Mexican National.—Andrew Anderson, Jr., has been appointed purchasing agent of this company, to fill the position made vacant by the death of George Bernard.

Missouri Pacific System.—Mr. Samuel Irvin, who has been master car builder for 11 years, has resigned.

New York & New England.—D. H. Nichols has been appointed general superintendent. Charles B. Phelps, division superintendent, has resigned.

New York Pennsylvania & Ohio.—H. N. Donaldson appointed superintendent of Mahoning division, succeeding C. R. Fitch, resigned. Headquarters at Youngstown.

Old Colony.—The resignation of C. H. Nye, as superintendent of the Cape Cod division, was finally accepted. To fill the vacancy, J. H. French, who has heretofore been superintendent of the main line, was transferred to that division; E. G. Allen, who has been superintendent of the Shore Line division of the New York & New England Railroad, was chosen to fill the place made vacant by the transfer of Mr. French.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Samuel P. Bush has been appointed acting master mechanic of the shops at Dennison, O., in place of C. B. Street, deceased.

Rio Grande Western.—S. C. Smith, superintendent of motive power, has resigned the position.

Savannah, Americus & Montgomery.—Wm. Argue has been appointed master mechanic.

Shore Line.—F. J. McPeake has been appointed superintendent.

NATIONAL CAR AND LOCOMOTIVE BUILDER

FEBRUARY, 1891.

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The Central Railroad of New Jersey are in the market for additional locomotives.

The Northern Pacific are about to let contracts for a large number of locomotives and cars.

Pennsylvania capitalists are investigating, with a view to erect car works at Radford, Va.

The New York, Providence & Boston have not yet closed their contracts for coaches and locomotives.

The Chicago & Northwestern Railway, it is stated, are asking for bids, or will do so soon, for 50 passenger cars.

The Delaware, Lackawanna & Western have placed contracts with the Pullman people for ten new passenger cars.

The boiler of a locomotive belonging to the Philadelphia & Reading exploded at Gordon, Pa., last month, instantly killing three men.

The subject to be discussed at the next meeting of the New England Railroad Club will be Painting and Varnishing of Railroad Rolling Stock.

For some time the Chicago & Northwestern Railroad Company have been spending $10,000 a month on equipping freight cars with air brakes and automatic couplers.

The Chesapeake & Ohio Railroad Company will make extensive additions to their machine shops and roundhouse at Clifton Forge, Va. These improvements, aside from new machinery, are to cost $100,000.

The construction of works for the building of steel cars in Chicago is just about to begin. We are beginning to lose tally of these announcements and are becoming melancholy about the future prospects of wooden car builders.

A car axle bearing has been invented by William B. Smith, Atlanta, Ga., with convex crown which fits into a concave seat in the oil box. The idea is old, but certain combinations relating to details of design have been patented.

It is reported that the Michigan Central are about to contract for 50 passenger cars and 4,000 freight cars. It is altogether probable from information obtained, however, that the contract for freight cars will be postponed until spring.

The Chicago, Burlington & Quincy Railroad have pigeon-holed their specifications for 50 passenger cars, on which builders were asked to bid last month; it is supposed that the order will be held back until the money market becomes settled.

An item appeared last month in a Buffalo daily paper mentioning some new locomotives that were to run between Niagara Falls & Point St. Charles. The readers were informed that the engines had power mansell rings capable of keeping the tires on the boilers.

The officers of the New London & Northern Railroad have agreed to grant an advance of wages for all men employed on freight train service. Brakemen are advanced from $1.27 per day to $1.60; conductors from $1.90 to $2.21 per day; firemen from $1.58 to $1.75 per day. Hereafter the road agrees to pay extra for all time over 10 hours per day.

There was a very interesting meeting in the rooms of the Railroad Branch of the Young Men's Christian Association connected with the New York Central Railroad at New York on the fifteenth anniversary of the formation of the branch. Mr. Cornelius Vanderbilt presided, and addresses were delivered by the Hon. Abram S. Hewitt and by the Hon. Chauncey M. Depew. There was an excellent musical programme, and the affair closed with a reception given under the direction of a committee of members in train service.

Circulars have been issued by the Committees of the Railway Master Mechanics Association, having on hand the investigation of the following subjects: Operating locomotives wtth different crews; locomotives for heavy passenger and freight train service. Secretary Sinclair announces: A general index of the annual reports of this association, from the 1st to the 23d, inclusive, has been prepared and is ready for sending out. Members desiring to obtain the index will receive it, free of charge, on applying to the secretary.

In the car shops of the Chicago & Northwestern Mr. Schroyer has in use a very simple and efficient arrangement for lifting work to tools. Beside each tool a cable with grasping appliances at each end is rigged over a movable pulley block hung from a convenient point. When a workman wants to change an axle on a lathe, a wheel on a boring mill, or any other article too heavy to lift by hand, he attaches one end of the cable to the piece to be raised, and the other end to the piece to be lowered, and makes the descending weight do the principal work of raising the other.

When passenger trains are standing at stations taking in or letting off passengers in the neighborhood of large cities there is a well known rule that trains coming in the opposite direction must stop short, as a precaution against running over passengers that may be leaving the other train. This rule was in force on the roads in the neighborhood of St. Paul, yet it was violated by Engineer Ratchem and he ran over several persons at University station, killing them. He was held on a charge of manslaughter and was recently discharged on the order of Judge Emery, who held that he was only guilty of an error of judgment.

The car service association work has resulted in a great measure of good, say the railroad people. According to a report by E. E. Hill, secretary of the National Association of Car Service Managers, the system in vogue has resulted in reducing the general average detention of cars 68 per cent., thus saving hundreds of thousands of dollars to the railroads and improving their service. Twenty-two car service associations handled 1,220,350 cars during May, June and July of this year, the average detention per car being one and a half days, while before the organization of the association it was over four days in the East and from six to eight days in the West. The general average is called five days.

Among the bills introduced into the State Senate of New York is one which the railroad men hereabouts call "The Veteran." It is entitled "An act to prevent accidents on railroad trains." It provides that passenger trains of six cars or less shall have two brakemen on each car, and that for every three cars added there shall be another brakeman. Freight trains of thirty cars shall not have less than four brakemen. This is only a modified form of a bill that has been up annually for many years. It was originally introduced in the interest of the Knights of Labor, who desired to see the number of employés on the railroads increased. The bill is preposterous. In these days of the perfected air brake such a crowd of brakemen are not needed.

The spirit of innovation appears to be running away with many railroad master mechanics now-a-days. The brass ornaments on locomotives are rapidly becoming a thing of the past, and there is no saying what familiar eye mark made venerable by years of use has next to go. Even the Russia iron planished jacket is no longer universally used for locomotive boiler covering. The Boston & Albany and several other roads have used common sheet iron for this purpose, and a coat of paint makes the covering look respectable. We now learn in the far northwest the Soo road, with the many other names, has adopted the sheet iron idea, and that there is no difficulty experienced with the boilers freezing up.

The *Railway Engineer* of London, commenting on the Twenty-third Annual Report of the American Railway Master Mechanics' Association, says: Extracts of some of the reports have already appeared in our pages, and we shall have occasion to refer to some of the others in our future issues. We consider them to be of the greatest possible value, as they are in most cases the result of a year's careful research and investigation by five experts. We have nothing published in this country at all comparable to them; occasionally one of our locomotive engineers will read a brilliant paper before the civil or mechanical engineers, but there is nothing equal to the steady flow of valuable information which the American Railway Associations publish for the benefit of the world.

The percentage of passenger cars that are running with their air brakes in a useless condition may be inferred from the fact that on one of our first-class roads, where particular attention is bestowed upon every part of the car equipment, 1,432 passenger cars arrived at an inspection point with the air cylinder piston at the end of its travel. Of these cars 1,091 were sleepers, 48 day coaches, 254 express cars, 18 dining cars, and 21 refrigerator cars running on passenger trains. The Potts piston indicator is used on the road and appeared to have had the effect of gradually reducing the number of cars that were running with their brakes in a useless condition. In January the number of cars reported to have their pistons up was 204, while in the December following the number was reduced to 74.

Complaints were frequently made by the men running certain locomotives on the Chicago, Rock Island & Pacific that the engines were particularly hard riding, and Mr. Geo. F. Wilson, the general master mechanic, recently investigated the matter. He found that the engines had over 100 pounds too much counterbalance weight in each wheel. When the weight was reduced that amount the engines ran as smoothly as any well designed locomotive may be expected to do. When a locomotive has so much superfluous weight swinging round in the driving wheels that it acts on the springs to make the engine ride badly, it is interesting to speculate on what are the results of the downward blows. The hammer blow may be depended on to do its evil work in proportion to the weight of the hammer.

Some 10-wheel locomotives built for the Wisconsin Central Railroad by the Brooks Locomotive Works, of Dunkirk, N. Y., have the following dimensions: Cylinders, 18 × 24 inches; diameter of driving wheels, 63 inches; diameter of truck wheels, 30 inches; wagon top boiler, 54 inches diameter; firebox, 78 × 34½ × 73 inches; 204 tubes, 2 inches diameter and 13 feet 10 inches long. Grate area, 18.25 square feet. Heating surface, 130 square feet in firebox and 1,470 square feet in tubes. Boiler pressure, 180 pounds. Weight on driving wheels, 88,800 pounds; weight on truck, 29,200 pounds. Driving wheel-base, 16 feet; rigid wheel-base, 9 feet; truck wheel-base, 5 feet 10 inches; total wheel-base, 26 feet 1 inch. The tender is carried on 33-inch truck wheels, and weighs 75,000 pounds loaded; it has a capacity of 3,700 gallons of water and 8 tons of coal.

The capitalists of Chicago took hold so heartily of the project of building capacious locomotive works as a successor to the Grant Locomotive Works, of Paterson, that others think that a new company might enter successfully into the business of building locomotives in Chicago. Accordingly, an announcement has been made that one million dollars of capital has been subscribed to build new locomotive works there that will employ 2,000 men. The prime mover in this enterprise appears to be Mr. Hugh R. Walker, inventor of the Walker smokeless locomotive of happy memory, and we are informed that the smoke consumer patents and company running them will be absorbed by the new locomotive building company. If the locomotive company inherits the success and popularity of the smoke consuming locomotive there will be no difficulty in taking in capitalists.

An English inventor has patented what he calls a Sans-Exhaust Engine by the use of which he expects to save the immense loss of heat passing out with the exhaust steam, common to all steam engines. This engine is designed to use steam for forcing the piston through one stroke, and then be driven back into the boiler by the return of the piston, aided by the inertia imparted to the flywheel during the first stroke of the piston. The would-be performance is based on a fallacy induced no doubt by observation of the pressure given to compressed steam in ordinary engine cylinders. Compression does very well to cushion reciprocating parts, but those who try to get the steam back into the boiler by this means will soon discover that they are just short of the margin of energy that finally brings all perpetual motion devices to the goal of exploded fallacies.

The St. Charles Car Company, St. Charles, Mo., have lately completed and delivered four passenger coaches for the Kansas City, Nevada & Fort Smith Railway, and four baggage cars, six first-class passenger coaches and two chair cars for the Jacksonville & Southeastern Railway. The interior of the coaches was finished in selected San Domingo mahogany, mounted with solid bronze trimmings and lamps. The seats were of the Scarritt-Forney type, upholstered with olive plush in the coaches, and old gold frieze plush in the chair cars. The saloon and toilet room walls of the latter were handsomely marbleized, thus presenting an entirely new feature of finish. They have also been awarded a contract for 17 chair cars from the Missouri, Kansas & Texas Railway, which are to be constructed upon an entirely new plan of interior arrangements. The first installment of this order is to be delivered in March next. They have also under construction ten first-class coaches and two private cars.

A Visit to Maine.

EDITORIAL CORRESPONDENCE.

ON THE MAINE CENTRAL RAILROAD.

January is not the best month of the year to visit Maine, unless a man has a taste for the amusements and exercises that pertain to snow and ice. Without the inspiration of that taste, I ventured last month as far as Waterville, Me., to look upon the shops presided over there by Mr. Amos Pilsbury, who, as most people know, is head of the mechanical department of the Maine Central Railroad. This railroad is the leading artery of travel between the United States and the Canadian maritime provinces, and a highly creditable and reliable route it is.

Although the deep snow formed a mantle that was liable to hide the rough edges of railroad structures, there was enough above the beautiful to show that the well-known prosperity of the Maine Central rests on a substantial foundation. The smooth running of the fast train proved the road bed to be in the best of order; the numerous bridges are nearly all iron, resting on granite piers. The station buildings are in nearly all cases comfortable, substantial looking structures, as becometh the surroundings, and many of them are models of elegant design. A notable thing about the stations is the ample siding accommodation. The convenience and economy of having plenty of room at stations appears to be understood by the general manager, Mr. Payson Tucker, for during the last year over 17 miles of new side tracks were added to a running track mileage of 773. If other railroad managers had a proper appreciation of the importance of ample siding accommodation there would be less delay experienced in the movement of trains, and fewer freight cars would be needed to do the carrying business of our railroads.

As these and similar seasonable thoughts coursed through my mind we kept rushing up the beautiful valley of the Kennebec River, which swarmed with busy ice cutters taking in their winter harvest. We linger not at the numerous thrifty looking towns on the wayside, only such well known places as Brunswick and Augusta meriting a stop. There are so many interesting sights to be looked at, that before we realize that we are well away from Portland the train pulls up alongside a metropolitan looking station house, the smiling countenance of Mr. Pilsbury appears on the platform, and we are at Waterville, the end of the journey.

THE MAINE CENTRAL SHOPS.

The locomotive and car repair shops are located about a mile north of the station, and were built about five years ago. They are good substantial brick buildings with iron truss roofs, and well arranged for the work to be done. The convenient arrangement of details and the numerous ingenious methods in use for facilitating the work to be done indicate the presence of a strong personality with decided views upon mechanical matters. This is Mr. Pilsbury, who holds a very high standing among New England master mechanics.

The machine shop and the car shops are in one main oblong building which is served by a steam operated transfer table. The engines to be repaired are run into one of the stalls which stand at right angles to the line of the building in the usual way. This particular stall has a drop table extending its whole length and operated by hydraulic appliances. Here the wheels are taken out and transferred to a track beside the pit, which leads them straight to the wheel lathes directly opposite. The whole of the wheel and axle work is done in one part of the shop, the lathes and wheel boring machines being located so that the work will be done with the least possible movement. Convenient cranes are provided for doing all the lifting. They have in use here the tool conforming to the cross-section of a tire for turning tires in connection with a Bement wheel lathe. It can be used only on tires that have no hard spots. They are using a double-headed axle lathe here, and finishing one axle an hour on it. To accomplish this requires particularly active work. This leads me to remark that I am still looking for the shop where twelve or thirteen axles are turned in ten hours, and when I get to a place where this large output is reported to have been done, there is always something the matter that prevents it from being done while I look on.

A PECULIAR BORING WHEEL CHUCK.

They have a chucking arrangement attached to a Bement boring mill here which is well worthy of general adoption. It is an arrangement of sliding wedges and Vs which can be moved by screws in any direction to secure the work in the desired position. With it they set a cylinder ready for boring in from 15 to 30 minutes. In a trial test they set a cylinder in the boring mill, bored it out and turned off the ends in five hours and 40 minutes. In ordinary work they finish two cylinders in 16 hours. The cylinders that were on the floor were notable for their ample steam passages, a feature that is unusual in New England practice.

ORDER AND CLEANLINESS.

They have a variety of the Pedrick & Ayer labor-saving devices in use on small work and make very good use of them. The tool room is off the line of the shop building in a wing where the engine room is, and is very well supplied with small tools, templates, etc., that are maintained in good order. Good order is a condition that is exacted in every corner of the establishment with cleanliness for a watchword. There is not only the greatest antipathy displayed to slovenly and uncleanly practices, as they tend to fill a shop with dirt, but the men receive every encouragement to keep their persons clean, the lavatory facilities provided being superior to anything I have ever seen in a railroad shop. In his efforts to maintain his shops in a model condition and to run tools and men to the best advantage, Mr. Pilsbury has cordial and able assistance in the general foreman, Mr. John Ellis.

BLACKSMITHING FACILITIES.

There is in the blacksmith shop a good equipment of power tools for producing forgings cheaply. Mr. Pilsbury appreciated the advantage of having a bulldozer for forming purposes, but the company were feeling too poor to buy one, so with the aid of his general foreman he proceeded to design and build a horizontal steam hammer which does the work very well. Besides this they have a heating furnace where the flame from the fire in the back end passes over the hearth to the front and then goes down through openings to a return passage below the hearth. By this means the heat from the furnace is particularly well utilized and the heat is maintained even. In the same shop they have another furnace which is a novelty. The foreman found that there was constant annoyance with the lining of the bolt heating furnace getting burned out, so some one in the place suggested the building of an iron furnace with a water jacket. This was done, and the furnace is quite a success. It is an oblong iron box with inside and outside shell like the sides of a locomotive fire box on a small scale. The water is automatically supplied from a small tank, and the steam, generated by the heat, passes off into the shop without being felt.

OPERATING UNDER DIFFICULTIES.

Although the Maine Central is a comparatively small road, there is a great deal of work involved in keeping in repair the 125 locomotives and 3,000 cars used in operating. The 773 miles of the road is divided up into 12 branches, many of them running into mountain regions. The number of short runs that are used may be understood from the fact that there are 29 engine houses and 28 turn tables. Short runs have a tendency to lower the apparent showing of economical operating, yet the locomotives on this road made last year an average of 38.66 miles to the ton of coal, the trains heavy, too, and the grades steep.

They have for the last year been running mogul locomotives on their heavy fast passenger trains, and the performance has been highly satisfactory. The engines are of Mr. Pilsbury's own design, and are particularly well proportioned. He uses what is known as the Jewell pony truck, which has no radius bar, but is guided by two conical toothed rollers. The design is old, but has not been much used. Mr. Pilsbury speaks very highly about the performance of the truck, and the condition of the forward drivers and of the truck wheels indicates that the truck leads the engine with a minimum of friction.

IN THE CAR SHOPS.

The car shops, which are under the charge of Mr. C. H. Kenison, are very well provided with facilities for doing work, but there is very little done at present beyond repairs. They have a particularly convenient planing mill, equipped mostly with Fay tools, which the foreman devoted much time to praising. A convenient kink in this shop is the air end of a Westinghouse pump operated by a connection with the shop machinery. The air pumped is employed for testing the air brakes of cars that have been repaired. The company uses 140 passenger cars, and the practice is to have every car through the shop each year, so there is a good deal of work done. In December they had 15 passenger cars and 160 freight cars through the shop. Last year they built four baggage cars, five cabooses, one postal and two combination cars, beside for some of the time about two freights a day. The oak for car building they get on their own road, and the other timber used is principally Georgia pine. They use the Sewall system of car heating in all their passenger cars, and speak warmly of its success.

HYDRAULIC TRANSFER JACKS.

In the roundhouse adjoining the machine shop there are two pits, connected, provided with Vreeland wheel removing jacks. The jacks can be lowered deep enough to take driving wheels from under an engine. The practice is to take the wheels from under the engine standing on one pit, transfer them by the connecting alley to the other pit, and then raise them and take them to the lathe, or dispose of them in any other way.

A SUCCESSFUL SAND DRYER.

In connection with this engine house there is the best sand dryer I have ever examined. It is a long V-shaped trough, with an opening along the bottom, and having steam pipes in the bottom part. Beneath that again there is an oblong frame of stack netting which catches the stones but lets the sand fall through. With this sand dryer Mr. Butler says that the keeping up a stock for the locomotives is no longer a matter of difficulty. I feel certain that many roads would like to see an end of their difficulties connected with sand drying.

A CONVENIENT OIL HOUSE.

They have a fire-proof oil house that has several novelties of design. The tanks containing the oil are sunk under the floor on two sides of the house and their sides come up about three feet above the floor. The covering to the tanks is a folding iron door, beneath which there is a wire netting on which a pump is set. When oil is wanted it is pumped up into the measure and if any is spilled it falls back into the tank. The floors are concrete, the house is heated with steam, and there is no combustible material within the walls except the oil.

VALLEY FALLS SHOPS.

The principal shops belonging to the company are at Valley Falls, about six miles from Providence. The plant there comprises both locomotive and car works and is one of the neatest arranged establishments in New England. They are making some important changes to increase the capacity of the place and I hope to give a description of the whole thing in the near future. Only one thing I would mention which, however, is not new to most New England railroad men. They have a complete system of templates of every part of their cars, passenger and freight.

BURNING HARD COAL IN NEW ENGLAND.

The rolling stock under Mr. Butler deserves particular mention for the excellent condition in which it is maintained and for the fine appearance of locomotives and cars. Another thing that he deserves credit for is the making a success of hard coal burning locomotives in New England. It might be asked, where is the difficulty in burning hard coal in New England that does not exist in Pennsylvania? More than one railroad company obtained locomotives built similar to those used on the Pennsylvania and other roads for burning hard coal, and got some men accustomed to anthracite to fire and run the engines, but some occult influence prevented the engines from doing their work successfully. When the management of the Shore Line intimated that they wanted some of the trains pulled by hard coal locomotives, Mr. Butler undertook to make the engines a success. He designed the engines for this service, and when they were put to work the very greatest difficulty was encountered in getting the men in charge to make the time. Mr. Butler is a locomotive engineer himself, so he determined that the engines should do the work if he ran them himself, and by his untiring vigilance he forced success where there was evidence of powerful influence being put upon his men to make his engines fail.

Some men in New England who are very well posted do not hesitate to say that the bituminous coal interest in that region have exerted a potent influence against the success of hard coal locomotives.

A. S.

New York, Providence & Boston Shops.

THE PROVIDENCE SHOPS.

During certain visits to Mr. L. M. Butler, master mechanic of the New York, Providence & Boston, I have found him crowded at Providence into small dingy quarters where even his sanguine temperament found litt'e to commend, and which he never displayed any anxiety to show to visitors. He has now bloomed out into new shops that have been erected to suit his own tastes, and any man interested in locomotive lore may now make sure of a hearty welcome and an invitation to go and see the shop. This invitation hit me and I went. The shop is a neat concern, only about 60 × 100 feet, two stories high, and it is merely intended for doing the work of the Shore Line division, but it is very well arranged and equipped with good tools. Among the new tools put in is a Pond 79-inch wheel lathe, and several fine engine lathes from other makers. The proximity of this shop to the Rhode Island Locomotive Works enables Mr. Butler to dispense with the use of many conveniences that would otherwise be necessary. The machine and erecting shop are on the ground floor of the building and upstairs are the tool room, offices, and excellent rooms for the engineers and firemen belong to the road.

The Iowa Railroad Commissioners have displayed no inclination to ask the farmers of Iowa to supply railroad companies with corn below cost, but they do not hesitate to order railroad companies to run trains in places where the receipts are not sufficient to pay operating expenses. An order has lately been given directing the Chicago, Rock Island & Pacific to improve its passenger train service, and a conflict in the courts is likely to result from the refusal of the company to spend money without a prospect of a fair return. The company appear to have acted fairly, for some time ago the managers offered to the complainants in the case to furnish them with all the train service they demanded if they would only guarantee the operating expenses. The Burlington road, upon which similar demands were made, offered to supply the necessary rolling stock, charge nothing for trackage or interest on capital invested, if ten of the petitioners would undertake to see that the actual expenses in running the trains were provided for. The offer of neither road was accepted. The Iowans claim that because these roads are able to make money on business done outside that State, therefore they must furnish the accommodation they ask for, though they lose money in doing so.

Length of Locomotive Radius Bar.

BY L. R. POMEROY.

1. The function of the radius bar is to compel the pony truck axle to always remain parallel with the driving axles on tangents, at the same time permitting the truck to assume radial positions on curves.

2. The duty of pony truck wheel, as in a four-wheel truck, is to prevent the forward, outer driving wheel flange from grinding against and counteract the natural tendency of this wheel to mount the rail, and to create a certain force or stress to cause this wheel to stand away from, or at least, relieve its pressure against the rail. In order that this may be accomplished, "force or pressure must be applied at some point on the axis of the driving wheel base, sufficient to cause the wheel base to change its direction, and follow the curve sooner than it naturally tends to do."

3. "The pony truck naturally tends to roll forward in a straight line, the driving wheel base behind, and not its own flange or coning, compels it to move in a curve."

4. For each particular flange wheel base there is such a location of the radius bar pin that will hold the truck axle always in a line coinciding with the radius of any curve on which the locomotive may be standing.

5. To enable the pony truck to lead properly and guide the engine, to relieve the strains on outside forward driver, also to reduce this source of flange wear and consequent liability to shock from impact of this wheel against the rail on entering a curve, it is necessary that the radius bar should be somewhat shorter than the exact geometrical or radial position, causing the rear end of the radius bar to move towards the outside rail, as *A B*, Fig. 1., creating a tendency to run toward the inside of the rail. It is therefore obvious, that if bar is too long the drivers will show excessive flange wear; if too short this wear will be noticed in the truck flanges, and the problem at hand is: What is the proper length to equalize or divide this wear between the forward drivers and the truck wheels?

6. The first point, then, is to locate the true geometrical or radial position, and there are several ways of doing this.

We will consider only two of the more common or well known methods, namely, Fig. 2 and Fig. 3.

In Fig. 3 let *A* equal the rigid or driving-wheel base; *B C* equals half of distance *A*. Make *B C* perpendicular to the rail line *x y*, and through the center of pony truck axle, making *B C* equal half the rigid wheel base. From a point, *D*, midway between the forward and rear driver (that is, half the rigid wheel base), draw a line touching *B C* at *C*; bisect *C D*. From the point so found, *E* (midway between *D* and *C*), draw a line perpendicular to *C D* and prolong this line to rail line *X Y* at *F*, then the distance *F B* will equal the length of bar to be radial with the curve.

7. These two methods can be graphically illustrated by plotting as per Fig. 4. This clearly shows how much reliance can be placed on the formulas mentioned.

Let *y z* represent the center line of a curved track with the radius *x b*. *A B* equals the rigid driving wheel base, and *B C* is the distance from the center of forward driving axle to the center of the pony truck axle, the line *A B C* being drawn through center of frame. With *B C* as a radius, draw the curve *C D*, *D* being located on the center line of track *y z*. From the center *x* draw the line *x D*. Then draw the line *D F* perpendicular to *x D*, the point *F* being located on the center line of frame *A B C*. The line *D F* + the distance *F B* will be more than the distance *B C*, as the sum of the base and altitude of a triangle are greater than the hypotheneuse. Scaling the distance *D F* and *F B* we find it is 96½ inches, or 6½ inches more than *B C*. On the center line of track *y z* locate the point *E* 6½ inches from *D* and toward *B*. Connect *E* by a straight line from the center *x* and draw *E G* perpendicular to *x E*, *G* being on the center line of frame *A C*.

Then the sum of the two sides *E G* and *G B* will equal 90 inches, or the distance *B C*. Then *E G* equals 67½ inches. In the graphical demonstrations given in figures 2 and 3 this distance is 67.686 inches.

8. This leads us to point of how the correct length can be determined, and of this location there exists considerable difference of opinion, and this is a question where experience is of paramount importance. Great care has been taken to consult current methods, and we beg to submit herewith a list, taken at random, showing practice on prominent railways.

The writer, however, is disposed to concur with Wellington "That no strong tendency in the pony axle to run toward the inside rail is necessary, but only just enough to insure the driving wheel base shall, in fact, modify its natural path, by however little, since, if any force whatever needs to be applied to cause the pony axle to roll in the curve, it must necessarily be adequate to slip the wheels on the rails. The stress necessary to slip them a little is as great as to slip them a great deal. To slide the wheels, as to lift a weight the $\frac{1}{1000}$th of an inch, requires as great a static force in pounds as to slide a foot or a mile. The power consumed varies with the distance moved, but the force required to produce motion does not vary."

The swinging links can be made to very materially assist to the extent of being so designed as to utilize the force due to leverage in addition to the dead weight suspended therefrom.

Fig. 1

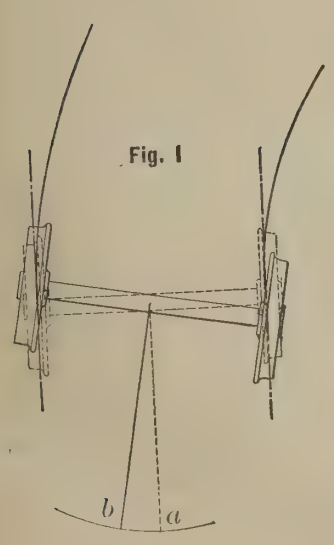


Fig. 2

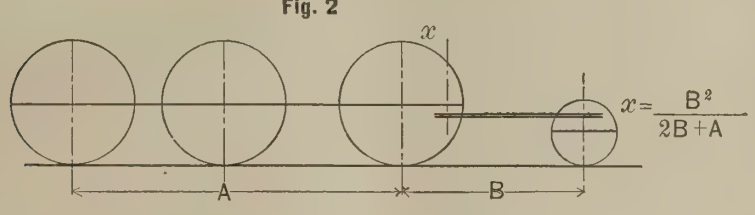
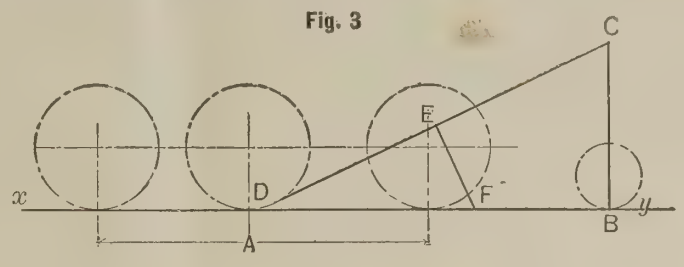


Fig. 3



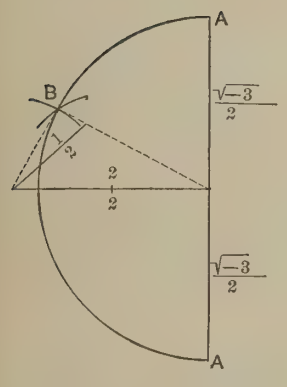
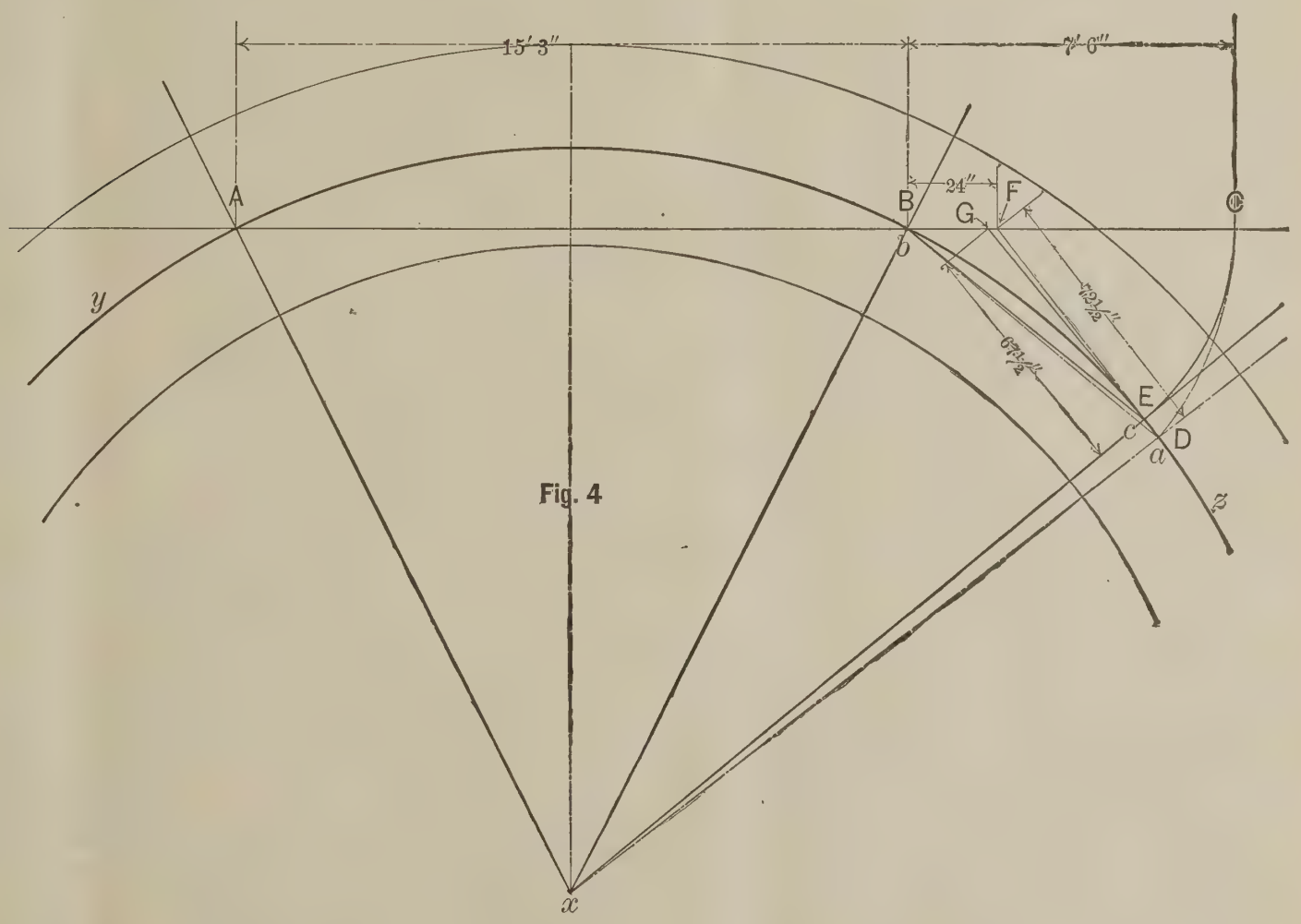


Fig. 4



CONSOLIDATION ENGINES.

Norfolk & W	14 0	7 6	5 6	—0.011
Union Pac	14 0	8 3	4 8	—0.225
Schenectady Loc. Works.	15 3	7 8	4 9	—0.170
P. R. R	13 10	7 10	5 6	—0.044
Can. Pac	14 3	7 0	5 2	—0.020
L. & N	15 8	7 8	5 1¼	—0.120
P. & R	14 0	8 3	4 8	—0.225
B. & O	14 4	8 0	4 3	—0.028

MOGUL ENGINES.

ROAD.	On A. Rigid wheel base.	On B. Distance between center of forward driver and center of pony wheel.	C. Length of radius bar.	Length C = per cent. — or + length found by formula.
	Ft. In.	Ft. In.	Ft. In.	Per cent.
M., L. S. & W	A=15 3	B=7 6	5 7¼	—0.007
N. Y. & N. E	16 3	7 6	5 2	—0.093
R. I. Loc. Works	16 6	7 8	5 10	+0.002
Grand Trunk	15 8	7 6¼	5 6	—0.030
Great Eastern (England).	15 9	7 5	5 7½	+0.0012
Brooks Loc. Works	15 6	7 6¼	5 3	—0.075
B. & Ohio	15 1	7 10	5 4	—0.090
L. & Nashville.	15 0	7 3¾	4 11	—0.110
C., B. & Q. (suburban)	14 4	8 1	5 4½	—0.094
" (Class H).	15 3	8 1	5 6	—0.083
Can. Pac	14 6	7 5½	4 0	—0.280
D., L. & W	15 6	8 3	5 0	—0.180
Old Colony	16 6	4 0	4 3	—0.290

We have "cathedral cars" in this country and there are churches on wheels in Russia. In New Zealand they have started a traveling bank, or rather banking facility. It may be described as a kind of portable teller's office. On certain days of the week a clerk from one of the Palmerston banks travels up and down the railway line from Palmerston to Otaki, transacting the ordinary business of the bank *en route*. Laden with a satchel containing his supply of cash and provided with a teller's usual precautions against danger of robbery, he makes the carriage his headquarters, and there receives visits from customers at the way stations, changing checks or taking deposits, as occasion may require. This plan is said to bring a good share of grist to the bank's mill and proves a great convenience to settlers who are saved all the trouble of journeying to town to relieve themselves of surplus money or to procure change; but evidently the New Zealanders are not properly educated up to the point of train robbery.—*Northwestern Railroader.*

Qualities Essential for a Free Steaming Locomotive.

At the January meeting of the New York Railroad Club, Mr. A. E. Mitchell, Mechanical Engineer of the New York, Lake Erie & Western, read a paper on the above subject. To make a locomotive boiler steam freely, he held it is essential that it should be designed correctly, that the various parts should be adjusted properly, and that the fireman should obtain as perfect combustion of the fuel used as possible.

Ample heating surface should be provided to insure that steam will be generated faster than it will be used by the cylinders under the heaviest work. Experience, practical observation and tests had led him to favor certain rules in locomotive design which were, briefly:

1. Use cylinders one inch smaller in diameter than you design your boiler for.

2. The smallest diameter of shell of boiler should be, as near as practicable, three times the diameter of the one inch larger cylinder.

3. The required amount of heating surface in square feet for bituminous coal burning engines should never be less than four times the square of the diameter of the one inch larger cylinder in inches. One-tenth of this heating surface to be in the firebox and the balance in the flues. On anthracite coal burning locomotives more heating surface is needed in the firebox on account of the larger grate area required, but the heating surface of the flues, as given by above rules, should not be materially decreased.

He favored making the grates in the form that would admit as much air as possible. The water space in the boiler should be made as large as possible, for a large volume of heated water provided a reserve force that often proved convenient. The smoke box appliances were described and the utility, form and dimensions of different draft regulating apparatus discussed.

In regard to smoke stacks he held that the old rule of making the stack about the same diameter as the cylinders was obsolete. To generate the draft on the fire necessary for steam-making, a smoke box vacuum varying from half to three quarters of a pound must be maintained, which is done by the steam passing through the stack. The exhaust steam, together with the smoke and gases of combustion, passing into the neck of the stack at a high rate of speed, nearly fills it, and then, expanding rapidly and filling the stack, causes the partial vacuum to be maintained which is required, hence the reason why the stack should be larger at the top than at the bottom. This then converts the stack into an ejector, causing the partial vacuum to be maintained in the smoke box, in the same manner as steam driven at high temperature and velocity through the injector nozzle produces the vacuum in the feed pipe, which raises the feed water to the combining tube. Knowing, therefore, that the stack is practically an ejector, we can utilize it for producing an increased draft on the fire, and therefore make our exhaust nozzles larger, as can be determined by experiment. Under this rule different sizes of cylinders will require different sizes of stacks, but if we equalize these values of stack and nozzle diameters we find it possible to use one stack with all usual size cylinders (17-inch to 20-inch diameters) and vary the nozzle and draft accordingly. Having one stack to fit all locomotives, the cost of maintenance is wonderfully reduced, and if the stack is made of cast iron the scrap from a damaged stack will go far toward paying for a new one.

The paper concluded with a dissertation on combustion and firing. He favored the carrying of a light fire, and advocated what are generally considered the best practices in the management of the fire. The paper ended with the following paragraph:

Engineers and firemen should work in perfect harmony with one another, each trying to aid the other as much as possible with their several duties. Too many engineers consider it out of place to assist or instruct young and inexperienced firemen, adopting the rule that, as no one showed him how to fire when he was young and inexperienced, he in turn would do likewise by his fireman; this policy on the part of the engineer is very selfish and should not be tolerated by any railroad company. The progressive engineer is one who is anxious to get his train over the road at the least expense of coal, or repairs to power, and will render all the assistance possible to his fireman. Were all locomotive engineers and firemen interested in the railroad company's welfare and handled their property as carefully as they would were the same their own, an enormous saving to the company would result, not alone in the fuel expenses, but in the cost of maintenance of locomotives and cars.

What Constitutes a Defect in a Vertical Plane Coupler.

At the January meeting of the New England Railroad Club the above subject was discussed very warmly.

Mr. J. D. Adams said that the railroad men in New England did not believe in the vertical face coupler. The question under discussion was made important by an order issued by Mr. William Buchanan, of the New York Central, in which positive instructions were given to car inspectors to refuse vertical plane couplers that had any defects. If a car having a broken knuckle is carded, the tendency is for other parts of the coupler to get broken by the shocks of the common drawhead coupled with a link. Then, for the credit of a knuckle costing $4, the receiving road was liable for a drawbar costing more than twice that sum. He was willing to accept couplers with small defects, such as half an inch broken off the top, but it was difficult to draw the line.

Mr. J. W. Marden issued an order the same as that sent out by Mr. Buchanan, and he was disposed to think that it was impossible to discriminate on what kind of a broken draw bar should be received, and what kind rejected. Thought with Mr. Adams that the New England roads were against the vertical plane coupler, and believed that many roads in other parts of the country were also opposed to it.

Mr. J. T. Chamberlain gave various illustrations of bad breaks in couplers that were behind small outside indications. He was opposed to receiving couplers that had any defects, and their practice was to replace all defective vertical plane couplers with common draw bars. From Oct. 15 to Dec. 31, 632 vertical plane couplers had been rejected on their line. The defects were: cracked knuckles, 165; broken knuckles, 154; missing knuckles, 85; common draw heads in place of vertical plane couplers, 41; various defects, 187.

Mr. L. M. Butler did not believe in taking middle ground on this coupler question. Thought the safest course was to refuse couplers having any defect. Could not see how any other rule could be fairly carried out by car inspectors.

Mr. Chamberlain mentioned a case where a connecting road had made cast iron knuckles to replace broken ones. When the inspector was taken to task for accepting cast iron knuckles, he said he thought that they were all of that material.

Mr. J. N. Lauder considered it of the greatest importance to have all freight car couplers in good order, for some of the most destructive wrecks on record had been caused by defective draw bars. Believed in the aphorism that the best way to get a bad law repealed was by strictly enforcing it. He thought that the most expeditious way of getting rid of the vertical plane coupler was by enforcing the rules concerning its use. This coupler has been foisted upon the roads by the mechanical papers, not only by advertising, but by procuring the writing of editorials, to make the managers believe the M. C. B. coupler a panacea for all the ills we are troubled with in the interchange of cars. Did not refer to friend Sinclair, who is present, nor to his paper, in making this statement. Believed that the vertical plane coupler had proved the most dangerous thing on our roads, and hoped to see an organized effort made to displace it. Felt that the unprejudiced men at the heads of railroad mechanical departments were almost unanimously opposed to the vertical plane coupler. Men disliked to acknowledge that they had made a mistake, and that sentiment still retained supporters to the coupler, but he felt that the dangerous character of the device would eventually lead to its general rejection.

Mr. Adams agreed with the position taken by Mr. Lauder. He said that his company had ascertained the cost of repairing couplers for the last three months of last year. Vertical plane couplers cost $4,389.89. They make their own knuckles. He calculated that the vertical plane coupler cars did not constitute more than two per cent. of the cars handled. Did not believe that there was more than 1,000 of these cars handled in the time mentioned. It cost the road during the whole year $6,375 for maintaining the old form of drawbar and for links and pins.

Mr. W. J. Robertson: If a car gets broken on our line, with an automatic vertical type bar, I consider it my duty to fix that car up and put in a knuckle or drawbar in first-class shape; but if a car is offered from another road with a broken knuckle or drawbar, I would say, don't take it.

Mr. Angus Sinclair told a story of some switchmen who were found smashing two cars together, trying to couple them with the hooks closed; knew that there was a great deal of trouble with this coupler breaking, but believed that the fault was not entirely in the coupler.

Mr. Barnes insisted that the vertical plane coupler was not getting a fair trial from railroad men. The men who handle this coupler ought to be better educated as to its use. Believed that the relative cost of the vertical plane coupler would be greatly reduced if the cost of paying for links and pins with the old coupler were taken into account.

Mr. Albert Griggs held that the vertical plane coupler caused extra expense for links and pins to the company he represented. These cars came in, and had to be supplied with links and pins to couple them with other cars. Was strongly opposed to the vertical plane coupler, and thought it would be wise and profitable for railroad companies to refuse cars so equipped, no matter what condition the coupler was in.

Mr. Marden corroborated Mr. Griggs in the claim that the vertical plane couplers were the means of making links and pins scarce. Believed the link and pin coupler to be more economical than the vertical hook.

Mr. Adams moved that the sense of the club be taken on the question whether it was desirable to sustain the order issued by Mr. Buchanan respecting the accepting of vertical plane couplers. When the vote was taken it was found that the railroad men present voted unanimously in favor of sustaining the order.

Rogers Locomotive Works.

During a recent visit to the Rogers Locomotive Works at Paterson, N. J., we found that many improvements had been effected by Mr. Wells since we were last through the shops. The tools in these shops used to be arranged in groups of certain kinds, all large lathes, all planers of about the same capacity, and other machines of similar dimensions being put together. This was convenient in some respects, as each man could be made to run more than one tool, but it often led to tedious and laborious moving of heavy work long distances to reach successive tools. Having all the tools together that are required for doing all the work on a particular piece, such as a cylinder or a frame, is now found to be the most convenient plan for doing work expeditiously, and Mr. Wells has arranged the tools in the Rogers shops in this way. Several other important changes have been made. The roofs of the boiler shop and of the tender shop have been raised sufficiently to provide room for traveling cranes that greatly facilitate the handling of material. The capacity of the boiler shop has been materially increased by the use of the traveling crane.

The blacksmithing facilities of these works have generally been short of the demands, and those in charge have had to exert ingenuity to get out the required forgings as they were wanted. This has led to the development of special methods, and the works now take the lead in the production of blacksmith material done by drop hammers, bulldozers and formers. They have lately added to their equipment of drop hammers, and expect soon to add others.

The shops are still working on the large Union Pacific order, and there were some mogul engines for Cuba in various stages of construction. They are turning out some engines for the Chicago & Grand Trunk that appear to have been designed with the view of increasing the expense of construction to the utmost limit. Some decapod engines for the Chicago, Burlington & Quincy are also notable for oddities of design that materially increase the expense of construction with no apparent benefit.

Practical Temperance.

The New York *Independent* sent out a circular to railroad superintendents asking for their views on the use of liquor by railroad men. Seventy replies were received from men having charge of thousands of trainmen, and they expressed an unbroken sentiment of hostility to the use of intoxicating liquor by the men working under them. The paper that elicited the replies, commenting on the subject, says: "There is nothing that teaches like practical life. The sermon that is not based on everyday practical life makes little impression upon the hearers. A man may be told that liquor weakens his physical powers, and will inevitably shorten his life, and he will find plenty of excuses to justify him in questioning the statement. But when he finds himself denied employment or dismissed from his position because he is known to use intoxicants the lesson is impressed on him more forcibly than all the logic of a reformer."

We are fond of reading this kind of sentiment sermons because we are great believers in temperance among railroad men. But we cannot help thinking that a better practical sermon would have been preached had the paper found out how many of the superintendents backed their temperance sentiments by personal example. A superintendent who writes to a newspaper advocating temperance among his subordinates and uses intoxicating drinks himself is a humbug.

Classifying Freight Car Repairs.

During a visit to the car shops of the Chicago & Northwestern at West Chicago, we were struck with the convenience of a system of freight car repairs used by Mr. C. A. Schroyer, superintendent of the car department. When cars come into the yard for repairs, they are not run promiscuously into the repair tracks. An inspector carefully examines each car to see what amount of repair is needed, and he cards it according to the work to be done. Three cards are used, marked respectively A, B, and C, and the card indicates light, medium or heavy repairs. After this is done the cars are distributed into the repair tracks to which the class of repairs belong. It will readily be perceived that this system prevents a great deal of useless moving of cars, and saves time that is so often lost by workmen who have to stand idle while the cars they are working on are pulled out of a track so that others may be taken out. This is constantly going on where cars undergoing all grades of repairs occupy the same track. Another advantage of the classified system is, that cars sent in for light repairs are more promptly returned to the transportation department, as no broken down cars stand in the way of drawing them out immediately after they are ready.

Join the Railroad Associations.

In his annual report of the Northwestern Railroad Club Secretary Robinson said:

Your secretary desires to take the liberty of strongly urging all members of the club who are eligible for membership to join the Master Mechanics' or Master Car Builders' Association, or both, and to attend the annual conventions. There are always present at the annual conventions some representatives from the Northwest who are the most valuable members of their respective associations. But the secretary knows from personal conversations that he is speaking the opinions of all those members of this club who do attend these conventions when he very earnestly wishes that the Northwest might be more fully represented thereat. As most of those present are probably aware, the official paper of this club publishes daily reports of both conventions during their sessions, and has in a certain sense come to be regarded as the official paper of the conventions. There is no reason why the Northwestern men and the Northwest Railroad Club should not play an important and valuable part in the proceedings of the two associations and the benefit would certainly be reciprocal, as no railroad man can fail to derive advantage from attending the associations if he cares to derive advantage and to improve himself.

John Fish, of Summit, N. J., has invented and patented a bicycle locomotive with two drivers and a two-wheel truck at each end. The boiler is hung below the driving axles.

Car Service Reform.

At the January meeting of the New York Railroad Club Mr. W. G. Wattson, of the West Shore Railroad, read a paper on Car Service. He considered that car service reform promises a larger saving in operating expenses than is possible in any other branch of railroad service. Notwithstanding the efforts of various organizations composed of railroad officers to improve the character of car service, it is no better than it was five years ago, the average performance is less and the private car question more complicated. We have over 1,000,000 freight cars in service, and the average mileage is from 17 to 25 miles per day, or less than two hours of running. A car ought at least to make 40 miles a day. Were this average secured, 500,000, or one-half the present number of cars, would be sufficient to meet the demands of transportation. On this basis the cost of the surplus cars, side tracks, motive power, etc., represents a needless but permanent investment of over $290,000,000 and an additional yearly expenditure of $23,000,000, without including interest on the money.

The author gave particulars of the various combined efforts that have been made to reform the system of car service. Mr. Albert Fink, when Trunk Line Commissioner, succeeded in getting 41 companies to try the combined day and mileage charges and it promised well; but the companies supporting the plan were too few and it failed for want of proper co-operation.

The efforts of the General Time Convention to effect reform led to the birth of the Car Service Association, which provides for demurrage charges from car users who retain the cars beyond a specified time. Statistics recently collected indicate that this movement has not improved the car service.

The Society of Railway Superintendents have now taken up the question and they are working on the development of better methods of handling cars with a view of increasing the average mileage.

The cardinal features of any car service system must be per diem, demurrage charges and systematic method, but the author considered that after the best was done by these means the car service must still be unsatisfactory.

He outlined a plan of car trust to own and handle all the cars in large geographical districts, and urged this as the only means of handling the car service of the country satisfactorily. The stock of the trust would be held by the railroad companies, and they would be assigned cars according to the tonnage of freight handled per mile of railroad operated. Although the railroad companies would constitute the car trust, it was proposed that no one directly interested financially in any of the railroads should have anything to do with the managing of the trust. The plan is of a gigantic nature. He called upon the members of the club to aid in working out details of an acceptable plan of car service reform.

Methods of Hanging Brakes.

At the last meeting of the Southern Railway Club a paper on the above subject, prepared by Mr. P. Leeds of the Louisville & Nashville Railroad, was read. The following is the paper slightly abbreviated:

TO PROMOTE SAFETY IN CAR COUPLING.

In 30 years of observation I have never known a hand crushed directly between the drawheads of cars in coupling; still, from late reports, one would think this the greatest danger of coupling, while the facts are, it is one of the least. Fingers and hands between pin and dead-wood, hands and arms between dead-blocks, and feet caught by the wheel, and the brake beam catching them and holding the foot and ankle in the best of positions for the wheel to do its work by throwing the person down, are the most frequent causes of injury and death. Some trucks must be built where an inside hung brake is impracticable, and so the only thing we can do is to make one hung outside as safe as possible. My idea is to so hang it as to enable brakemen and switchmen to step on and ride when coupling; or else carry the beams so far under the car as to always clear. This last cannot well be done, but the former can, by using hangers so short as to preclude all danger of them swinging sideways, and by placing hand holds on the end of cars on all four corners.

SAFETY IN RUNNING.

As to safety in running, any of us would hesitate to say that a truck built so rigid that all the wheels were held in the same plane regardless of whether one of them supported or not, was as safe as the passenger truck with each wheel free to follow every depression by the vertical play of the box in the pedestal. Then why is it safe to clamp these wheels to a rigid body in such a manner as to make it impossible not only for one wheel but for any of them to accommodate themselves to the conditions of the track, even on a straight line? This is, in my opinion, poor practice, as the strain thrown on hangers is about the same when the wheel strikes a low joint as though it was a suspension bolt carrying the entire load on that wheel, our system of hanging below the center making the connection rigid. The great danger from this practice is in going on to or coming off a curve, or worse yet, a reverse curve with your truck clamped rigidly to the body. On a straight line, the normal conditions are that each wheel is held equidistant from the body, but on striking a sharp curve with great elevation, both the canting of the truck and the position the body takes bring the truck and body closer together if the brakes are not set, or try to do so if they are. Under these conditions the brake shoes must slip on the wheels, which they can scarcely do, or else, failing to break the hangers, carry the inner side of the truck around the curve in just the degree of the effort of the car to right itself or to assume an upright position.

CAUSES OF DERAILMENT.

From several years' close study of the causes of derailment, reported as brake beams down, etc., by taking notes at the scene, I have nearly always found the derailment at or near a curve, or found a bad low joint just where the first marks were found. In nine cases out of ten when the brake has been the cause, body hung brakes have been used, and the hangers in every case showed a fresh, new break, or the fastening was freshly torn out.

As a straight out denial has been made as to the conditions named ever existing, I would ask the gentleman if he ever undertook to let a brake off that had been applied under one of these conditions after it was changed. I have often tried it and found that a brake that I had applied on a curve could not be released when on a straight line, and the reverse.

Electrical Underground Railroad.

The City and South London Railway, a line recently opened about three miles long, and passing under the city of London, England, at a depth of about 60 feet, is operated by electricity, a means of transmitting power to trains that is peculiarly well adapted to underground railroads. The gases that pass from the smokestacks of steam locomotives are so obnoxious in underground railroads that the stifling atmosphere prevents many people from using that means of transit, so it is likely that electricity may be the means of increasing the income of an underground railroad sufficiently to balance the extra expense of the indirect power.

The following description of the method of using the electrical apparatus is condensed from the *Railroad and Engineering Journal:*

The current is conveyed from the dynamos to a general distributing and testing switchboard, fixed in a recess of the enginehouse. From this board, which resembles in some respects the Westinghouse switchboard, which is very well known, the main circuits are taken to various parts of the line, and the current passing through each circuit is measured, suitable arrangements being provided for switching over from one circuit to another. The main cables consist of a copper core of $\frac{61}{14}$ B. W. G., insulated with Fowler-Waring insulating material and then lead-sheathed.

The working conductor is of channel steel carried on glass insulators, the joints being fished and also connected with copper strips. The steel employed is of very high conductivity. The working conductor is divided into sections for convenience of testing and carrying out repairs on the permanent way. The insulation obtained is extraordinarily high. When the full pressure of 500 volts is on the complete system of working and feeding conductors, the leakage current does not exceed one ampère, so that the total loss by leakage is less than one horse power; this is a small fraction of one per cent. of the total power required for working the line to its full capacity. The current is collected from the working conductor by sliding shoes of iron or steel.

Fourteen electric locomotives have been supplied for working the line, each capable of developing 100 effective horse-power, and of running at about 25 miles per hour. The locomotives are constructed so that the shafts of the armatures are the axles of the locomotives. The driving wheels run at about 240 revolutions per minute when the locomotive is travelling at 20 miles per hour. The locomotives have a fixed wheel-base, and a motor is fitted to each axle, the axles not being coupled, but working independently. The current is conveyed from the collecting shoes through an ammeter to a regulating switch, then to a reversing switch, thence to the magnets, and back through the frame-work of the locomotive to the rails. The locomotives are fitted with Westinghouse automatic air brakes, and also a screw hand brake, and they and the carriages are lighted from the working conductor by lamps in series. The compressed air for the brakes is stored in two cylinders, 12 inches in diameter, and the capacity is sufficient for three times as many stoppages as are likely to occur in any double journey.

A Pioneer Railway Train.

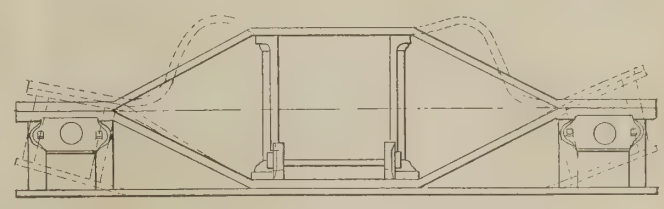
In the life of John Ericsson, the famous engineer, by William Conant Church, and published by Charles Scribner & Son, there is a rather interesting picture of the trial of Ericsson's locomotive, The Novelty, which competed in 1829 on the Liverpool & Manchester Railway with Stephenson's "Rocket" and other famous locomotives. Vinogles, the delineator of the train, was a famous French engineer of the early railroad era, and his picture is likely faithful to the truth. There is the locomotive and four cars. The locomotive had a small upright boiler on one end and a cylindrical water heater and the steam cylinders on the other. A plate iron water tank is hung in the middle of the machine under the frame, which stands very high. The cylinders are vertical and transmit power to a cranked axle. The engine is carried on two pairs of wheels of equal size, but not connected. A blower was used to keep up artificial draft for stimulating the fire. This engine was considered a remarkably well designed machine, and was the favorite of those entered for competition. It failed on account of the blower getting out of order, just as Peter Cooper's locomotive on the Baltimore & Ohio failed in a race with a horse about the same time.

The first car in the train is a four wheel "goods wagon" loaded with bales of wool. They seemed to think that would be good material to get bumped against in case of collision. The second car was a street omnibus of a kind then common in England, with the doors on the sides and having seats in front of and behind the doors. This eventually became the pattern for the railway carriage all over Europe. The last two cars were flat cars with private phaetons mounted upon them in which were seated the people who considered themselves too fine for sitting cheek by jowl with persons of lower degree.

This picture recalls a fad of early English railway experience now almost forgotten. The "carriage" people of that country were at first vigorously opposed to the leveling tendency of railway carriages that called for people to travel together who had never been introduced. Did you ever see a McLean who had not a boat of his own? said the Lochabar man on being asked how his ancestors traced their origin beyond the Flood and not through Noah. Did you ever see a Jenkins who could not ride in his own carriage? said the snobs of 1830, and they hired a flat car to carry their carriages which they occupied with complacent dignity. They tried at first to hold to the roads, but bad weather and miry roads forced them to the railways. Two or three cases of private carriages getting blown off the train eventually brought the practice of riding in them into innocuous desuetude.

Strength of Car Bolsters and Arch Bars.

Some experiments were recently made by the mechanical department of the Atchison, Topeka & Santa Fe to test the strength of freight truck bolsters and of the sustaining resistance of diamond trucks. The standard bolster of the company is an oak beam, $8 \times 10\frac{1}{2} \times 65$ inches. This bolster, supported by blocks of wood to represent the springs and center plate, was subjected to pressure in the testing machine and broke under a load of 72,800 pounds. A bolster of the same size, and having two truss rods $1\frac{1}{8}$ inches



imbedded in the timber, stood a pressure of 109,550 pounds before it broke.

The standard freight trucks have arch bars $1\frac{1}{8}$ inches thick at top, 1 inch at bottom, and the tie bar $\frac{5}{8}$ inch, the wheel base being $4\frac{1}{2}$ feet. The annexed sketch shows the arrangement of the arch bars. This truck was tested beyond its ultimate strength, and under a load of 128,200 pounds the upper bar buckled, as per dotted lines.

Another arrangement of truck, with the same depth of truss, yielded at 93,000 pounds. In this case the bars were set at a higher angle above the top line of the box, the outcome proving that the flatter the top bar the stronger the construction.

Information gained from the tests was that the strongest form of bolster which carries half the load is not so strong as the set of arch bars which carry one-quarter the weight of the car. This appears to indicate that the ordinary bolster is a weak point of the car, and the frequent breakage of bolsters supports this conclusion.

Additions to Rock Island Passenger Equipment.

At the Chicago, Rock Island & Pacific shops there have been received during the past month 21 new cars, built by the Pullman Company, Detroit. Among these are five splendid sleepers, 69 feet 6 inches over sills and 9 feet 8 inches wide. The interior finish is mahogany all through. The top berths and paneling are upholstered in embossed plush work; the ceilings are painted to harmonize with the colors used in the different cars. There is a stateroom at one end and a smoking-room at the other, which also serves for a gentlemen's toilet, as it is fitted with three wash basins. The trucks have six 38-inch Allen wheels and brakes on all wheels. The cars have the Pintsch lighting system, and are heated by the New York Safety Car Heating and Lighting Company's plant.

There are six chair cars and five day coaches, all having vestibules and finished in mahogany with oak ceilings. The cars are equipped with Scarrett seats, and are very artistically finished from ceiling to floor. The trucks are very substantially built and have a wheel base of eight feet, and are carried by 36-inch Fowler steel wheels.

There are five mail and baggage cars that resemble closely the other cars in general design. They are 50 feet over sills and 10 feet wide, having mailing room 22 feet long, fitted up with Harrison's patent mail racks and all the most approved facilities for handling mail.

The Chicago, Rock Island & Pacific car shops are still working short time, although they are full of cars. The work going on is mostly in the line of light repairs.

One of the greatest oddities in the line of car couplers that we have ever seen has been lately patented by Charles W. Hunt, West New Brighton, N. Y. The combination when put together has a close resemblance to the walking beam of an old-fashioned steam engine. It is of the vertical plane type, and would evidently fill up the whole end of the car.

A Handsome First-class Coach.

The standard first-class passenger car now built by the St. Charles Car Company has been exciting much admiration for its beauty of inside finish. The following is a detailed description of the car:

Width over side sills, 9 feet 8 inches; length over end sills, 51 feet 6 inches; height in center from floor to ceiling, 9 feet 5⅛ inches; width between upper deck, 5 feet 6 inches; height of clear story sides, 17 inches.

The sides of the car are divided for 17 windows, each 27⅛ inches wide for even side glass. Each two of the windows on the sides of car are set 4 inches and 10 inches apart alternately, for the purpose of relieving the monotony of repetition of finish. The top portion of the window sash, with 24 × 10-inch glass, is fixed stationary, while the bottom portion, with 24 × 24-inch glass, is arranged to slide upward to such an extent that gives ample clearance, so that the view of the passenger is not interrupted by the lower portion of the sash when raised up. The upper deck sashes are attached to clear story frame with the Hart ratchets, and can be deflected at any desired angle to admit of the air through the screens covering the clear story windows from end to end of the car on each side.

The flooring is made of 1¼ × 3¼ long leaf yellow pine, quarter sawed, tongued and grooved and laid lengthwise, and is well secured to the floor joist by steel nails.

At the base of the posts on each side of the car and resting upon the floor a truss plank is secured to the posts by means of screws which enter through the plank into the posts and bolts, which combine the side sills and truss plank more firmly, and thereby adding greatly to the strength of the side of the car.

The inside finish is executed in San Domingo mahogany; the portion below the window rest consists of a wainscoting with top and bottom rail framed together with mullions and panels at locations meeting the spacing of the seat ends and finishes the sides and ends of the car up to the door casings.

The finish above the wainscoting consists of alternate panels and pilasters. The panels, also of mahogany, are framed together with two upright stiles, one bottom and one top rail, three narrow panels lined with three narrow mullions and a beveled mirror in the upper portion of this panel.

The frieze above the windows, consisting also of two longitudinal rails framed together with small mullions and panels arranged for spacing of the basket racks on each center of two windows. Directly above the mirror a nice Romanesque ornament is placed in the frieze, while the narrow pier between the windows are cased in with a neat pilaster with base and capital. A well proportioned cornice molding crowns the frieze on both sides and ends of the car.

The windows are shaded by tapestry window curtains mounted on spring rollers balanced by an iron bar, which runs in a groove to prevent its flapping. The bottom of the curtain is finished with a worsted fringe and a loop on the reverse side, by which it can be held down on the sash lift.

The under side of the lower and upper deck carlines are covered with a three-ply veneer ceiling neatly decorated to harmonize with seat covering and other finish.

The sides of the clear story is cased over with mahogany panels and mouldings of a neat and substantial design.

The end doors are made of well seasoned solid mahogany consisting of two styles, one each, top, center and bottom rail mortised and tennoned together with one mullion between two panels at bottom, while the top is arranged with a double sash, the top of which is made to slide downward to any desired position.

The space admits for purpose of ventilation.

These end doors are bordered with a door casing consisting of various panels above the door and two neatly molded stiles on each side.

Immediately above the door casing a transom panel is pivoted at either end, upon which it may be deflected to any degree for the purpose of ventilation.

The arrangement of the car is as follows:

Commencing at one end, the ladies' lavatory and saloon is located on the right side entering the door, and the heater room and locker on the left side, opposite the ladies' saloon. The saloon, heater room and locker partitions are composed of vertical stiles, rails and panels framed together and molded, leaving the door openings at their proper locations for entering into the rooms and an opening for the alcove water cooler on one side and fire tool locker on the other side of the ladies' saloon front. The top of saloon front and the locker is covered with a ceiling panel, while the top of heater room is left open to dispense the heat through the car. The interior of ladies' saloon is fitted with a neat washstand, embodying all the modern features of a modern lavatory, consisting of pumps, soap dish, water cooler, pier mirror, comb and brush holder, cabinet seat, toilet paper rack and combination coat and hat hooks; directly in front of the pier mirror a lamp deflects by night the user of the lavatory, so that nothing can be wished for except perhaps a bath room and barber shop, which may be introduced in the near future on regular first-class coaches.

The partition or bulkhead, which closes the end of the saloon on one side and locker on the other, is substantially constructed with a mirror on each side of the passageway, and a spindled arch over the passageway opening, extending from one side of the clear story over to the other. This bulkhead is repeated at the other end of the car, where it forms the end of the gentlemen's saloon, and thus gives the interior of the car an airy and cheerful appearance.

The interior of the gentlemen's saloon, which is on the left side, facing it from the ladies' saloon, is also fitted with the latest modern arrangements, as hoppers neatly covered with hinged cover and urinal drip pan and pipe. This saloon being covered with glazed panels, admits the light from the center lamps in close proximity thereto. Both of these saloons are neatly marbleized, with the exception of such portions which make up the borders and casings, and the effect of this is very refreshing. The whole of the inside is varnished with three coats of varnish and rubbed down, leaving the finish without the glossy appearance produced by the varnish.

The style of seats used in our cars is left to the option of our customers, a great variety of patterns being in the market, from which to select.

The trimmings, such as hinges, locks, lamps, etc., are of solid bronze of the most modern designs, four two-light center lamps are suspended from the clear story roof, these lamps are equipped with the Acme burners and illuminate the cars most satisfactorily, so that the occupants of any of the seats are enabled to read without the least exertion or strain upon their eyes.

The Baker heaters with bent piping are adopted to heat the car, the heater being placed in the heater room on top of the coal box and the whole well secured to the bottom of the car.

South American Trans-Continental Railway.

It is confidently expected that the first railroad across the continent of South America will be finished next year. It is nineteen years since work was begun. The road is to run from Buenos Ayres to Valparaiso, a distance of 871 miles. There is now a distance of 640 miles of it finished at the Buenos Ayres end, and 82 at the Valparaiso end. Of the remaining 141 miles, about one-third is practically complete, the rails being laid.

HIGH MOUNTAIN RAILROADS.

The passage of the Andes is accomplished at the Cumbre Pass, which is 13,045 feet above the sea level. The railroad, however, does not reach the summit of the pass, but pierces the mountains by means of a tunnel more than three miles long, at an elevation of 10,450 feet above the sea. This makes it one of the highest railroads in the world, and the second highest railroad in South America, the Oroya railroad in Peru being the highest in the world, rising as it does to an altitude of 15,645 feet above sea level. The highest elevations reached in the United States by railroads are the Union Pacific's South Park division, which crosses the mountains at a height of 11,470 feet, and the Denver & Rio Grande at Marshall Pass which is 10,552 feet above the sea. The mountain railroads in Europe are dwarfs compared to this. The highest is the Rigi, 5,753 feet, then St. Gothard comes second and attains a height of 3,784 feet.

STEEP GRADES.

The new South American Railway ascends for a considerable distance at the rate of 422 feet to the mile. On this portion of the road a rack rail will be employed, similar to that used on the new Pikes Peak Railroad. If the road were in the United States it would likely be operated with a smooth rail, for there is a steeper grade so worked on the Denver & Rio Grande.

DIVERSITY OF GAUGES.

One unfortunate feature of the road, which will seriously impair its value, is the diversity of gauges adopted. The different sections of the road have been built by different companies, and each company has its own gauge. Thus there are 640 miles from Buenos Ayres to Mendoza of 5 feet 6 inch gauge; the 82 miles from Valparaiso to Santa Rosa are 4 feet 8½ inch gauge, and the remaining 147 miles from Mendoza to Santa Rosa are being laid in the narrow gauge of one meter. Thus, even when the road is finished, it will not be possible to run a train through from end to end. The seriousness of the defect is now appreciated, however, and it is probable that steps will be taken to make the gauge uniform.

Changes on the Union Pacific.

Harvey Middleton, superintendent of motive power of Union Pacific, is to be retired on Feb. 1, and will be succeeded by Joseph McConnell, formerly master mechanic of the shops at North Platte. Mr. McConnell's headquarters will be at Omaha.

Fred Mertzheimer, superintendent of the Cheyenne division, will be brought to the mechanical department, as assistant to McConnell, with headquarters at Cheyenne.

Mr. John Wilson, who has been with the Union Pacific for over 23 years as draughtsman, chief clerk, assistant superintendent of motive power, and in practical control of the motive power of the entire Nebraska division, has been offered the position of master mechanic of the Nebraska division. He has declined the position, and will leave the service of the road with the incoming of the new administration.

Speaking of the changes on the tapis in the motive power department an official at headquarters expressed surprise that Mr. Clark, in seeking a successor to Harvey Middleton, had overlooked John Wilson, whom he had appointed eight years ago to the position which he now holds and in which he virtually had complete control of the entire mechanical department of the system. During the incumbency of Hackney and Cushing Mr. Wilson's had really been the guiding hand, and this was also true, to a great extent, under the present administration.

The gentleman quoted expressed great surprise that Mr. Wilson's well known ability as a practical man and his familiarity with the requirements of the system, had not influenced Mr. Clark to appoint him as Mr. Middleton's successor.

"I feel confident," he remarked, "that if Mr. Wilson had asked for the position it would have been given him, but he is very modest about pushing himself forward and I presume he thought Mr. Clark was familiar with his record and would do him justice.

"I am not surprised that he has declined to serve under McConnell, as he—" Here he checked himself as if he had already said too much.

Being pressed for his ideas he merely said that he thought the new order of things would not last long, as McConnell had not been remarkably successful in his management of affairs under his charge when he was in the service of the company some years ago.

The refusal of Mr. Wilson to accept the position tendered him has rather unsettled the plans of the incoming superintendent and it is not known who will be placed in charge of the Nebraska division, which is the most important in the system.—*Omaha Bee.*

New Vestibuled Train—Piedmont Air Line.

New vestibuled trains have recently been turned out of the Pullman shops for the Richmond & Danville or "Piedmont Air Line." These trains consist of a postal car, a combination dining and baggage car, a sleeping car, and an observation car, and are now running daily between Atlanta and Washington. The dining room of the train recently on exhibition is finished in antique oak, with upholstering of white mohair cloth. Beveled plate glass mirrors are set in available portions of the wall space. The tables are of heavy oak, the carpet a Wilton, the ceiling painted in arabesque designs.

The sleeping car is finished in mottled mahogany, and contains a drawing room and state room, in addition to 12 ordinary sections. It is upholstered in white mohair cloth, and has draperies of silk plush embossed. The state room, like the drawing room, is finished in satin wood and has not only a private lavatory but a retiring-room as well. The washstands in the car are six in number, and have both hot and cold water.

The observation car contains in front some sleeping berths, but the rear and larger portion is fitted up like a parlor. The rear is almost all of glass, to afford the best opportunity for seeing. The platform outside is extended for open-air observation. The car is finished in mahogany and silk embossed plush, contains movable easy chairs, sofas and table, and two fine mahogany secretaries for writing. There are portières of silk plush embossed. There is a library of fiction, travel and adventure, and the leading newspapers will be furnished. There is also a buffet.

One feature to be added to these trains is a number of ladies' maids in uniform, intended to assist ladies and children in their toilets and in other ways, as they may be needed.

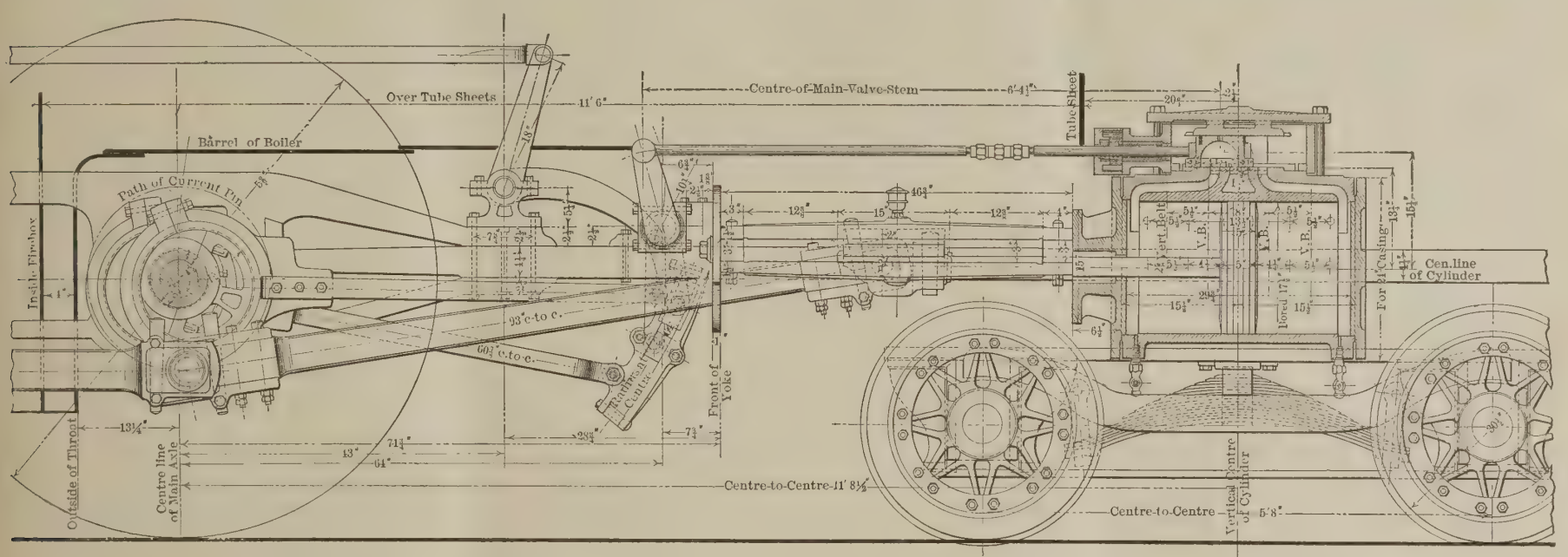
With these trains the trip of 650 miles between Washington and Atlanta will be made in 19 hours, 5 hours less than the time heretofore made. The trains will never be filled beyond their capacity, and the additional charge on them will be small. The cars will be lighted by the Pintsch gas system and heated by the New York safety system of steam heating. Every section will have its own lights. Electric bells are supplied.

When F. D. Adams had charge of the Springfield Car Shops of the Boston & Albany R. R., there was an antiquated tool that was in charge of a man nearly as antiquated in appearance as the old machine itself. Man and tool had grown old together. If we remember rightly, the old mortising machine went into the shop when it was built, and the man came in at the same time and ran it. In one sense the man kept the tool young. He made it do its regular day's work, and he could do anything on it of which it ever had been capable. It seemed to do as much work as ever, and yet it was an eyesore. It was patched and wedged. A shim had to go in this place and a washer in that for one kind of work. For another, a different arrangement was needed. This tool had to be set in a peculiar way, or it would cut out of plumb, while another tool had to have a rake in the opposite direction. But the old man knew the whole list of crotchets. He slipped in the washers and wedges at the proper times, set this tool a quarter out of true to allow for wear of the guides, and gave that one a twist to overcome the weakness of the foundation on the left side. If the old man had ever been ill or wanted a vacation the machine would have stopped, for no man in the 375 crowded into the little old shops could have made the machine do any better than gnaw wood like a rat. So Mr. Adams said: "As long as the old man is able to work, and as long as the old machine holds together, I shall let them alone. When one gives out there will be no use for the other." It is pleasant to know that the machine lasted till the old man was laid in his last resting place. Then there was a new machine within a week. The old man knew a trade which it did not pay any one else to learn.

The new "steam-heating wagons" for the Prussian State Railways have been put on the line from Berlin to Potsdam. They are built in the form of a luggage van, are painted brown, and are marked "Heizwagen." One of these wagons is placed in the middle of the train, the steam for warming the carriages being conveyed to the latter through flexible tubing from each end of the wagon. A low chimney through the roof is provided for the smoke from the boiler furnace.

Valve Motion of Central Vermont Locomotives.

The annexed engraving gives a very good illustration of a link motion worked out by Mr. W. J. Robertson, superintendent of motive power of the Central Vermont Railroad, and used for a group of passenger engines that were built for the road. The motion was schemed with the view of distributing steam as evenly as possible during both strokes of the piston and at the various points of cut-off, and to keep down the increase of lead as much as possible when the links were hooked up. Any one who may be interested sufficiently to put the motion on a drawing board or on a good model of valve motion, such as that made by the Richardson Estate, will find that the motion gives remarkably good results in steam distribution. We have examined indicator diagrams taken from engines having this motion, and consider that they bear the strongest testimony in favor of the motion. It will be noticed that the tumbling shaft arm projects beyond the center rocker shaft one-fourth of an inch forward. The reason for making it so was that when the engine was cut up on the quadrant so that the steam would be cut off at between five and seven inches stroke, the lifter attached to the link saddle would be in a perpendicular position, suspending the link in a position that reduces to the smallest degree the slip of the block. In other respects the motion has traces of careful and ingenious attention in trying to obtain harmony of action in parts that are difficult to control.



Arbitration Committee Decisions.

The Houston & Texas Central rendered a bill against Street's Western Stable Car Line for two new wheels and axle and labor, plus 10 per cent. less a credit for scrap. The company receiving the bill claimed that the 10 per cent. should have been added after the credit for scrap was deducted. The arbitration committee sustained the amended bill.

A car belonging to the Western New York & Pennsylvania was destroyed on the Vermont Central, and the latter company elected to repair the trucks and send them to the owners. When the trucks were received there was a bad axle in one which did not belong to the trucks. The owners asked for authority to charge for the defective axle, but the Vermont Central refused, and replied that the axle was in the same condition as it was in when received on their road.

The Arbitration Committee decided that the company repairing the car were responsible, as under rule 18 a company repairing foreign cars with wrong material are liable for the cost of changing such materlal to the original standard. If the Vermont Central accepted a car with a defective axle without a card, it indicated improper inspection, which made them liable to replace the axle.

The St. Louis, Alton & Terre Haute rendered a bill against the Georgia Railroad for $23.86 for two ventilator doors for the loss of which a card had been given. The Georgia Railroad disputed the bill and held that $10 was the proper charge under the Rules of Interchange for two side doors.

The Arbitration Committee admitted that the charge was correct for box car or freight car doors, but when a car is designed for a special purpose requiring in addition to the usual doors another set of doors such as ventilator doors on fruit cars the fixed rates cannot be applied to them. Decided that the charge was correct.

Nelson Morris & Co. rendered a bill against the Chicago, Milwaukee & St. Paul for repairs done to a car that had been carded by the latter company. Ten per cent. was added to the bill before credit for scrap was made. The railroad company objects to the 10 per cent. that was added, and the company rendering the bill replied that as railroad companies charged 10 per cent. extra for repairs made on private cars it was fair that the rule should be worked the other way.

The Arbitration Committee decided that Rule 10 did not prescribe whether or not private car owners might add 10 per cent. to their bills against railroad companies for repairs done, but in equity the charge was considered fair and sustained. But the bill had to be modified and the charge of 10 per cent. added after the credit for scrap had been deducted.

The Arbitration Committee recommend that the proper interpretation of Rule 10 be discussed at the next annual convention.

The Savannah, Florida & Western rendered a bill against the Nashville, Chattanooga & St. Louis for two drawbars and the cost of repairs to end sill. The charge was disputed on the ground that the card which was the basis of the charge merely mentioned "mixed drawbars" which was written in indelible pencil on both sides of the card. "One end sill damaged" was written on one side of the card with a lead pencil and this was repudiated by the road responsible for the repairs.

The Arbitration Committee decided that a defect card can only be used as a voucher in so far as it bears evidence of having been written wholly at one time and by one hand. They held that the card in question called for the replacement of one drawbar only.

The Pittsburgh & Western delivered to the Lake Shore & Michigan Southern a foreign car carded for broken draft timber and wrong drawbar. It became necessary for the Lake Shore to repair the draft timber to secure the safe transit of the car, and when that was done they changed the drawbar so that the card might be taken off to be used as a voucher. The Pittsburgh & Western refused to pay the bill for repairs on the ground that the removal of the draw bar by the Lake Shore was not necessary for the safe running of the car.

The Arbitration Committee decided that as the Pittsburgh & Western had repaired the car with wrong material it was responsible for the bill, even though it was rendered by a company that was not compelled to make the change of drawbar.

The objection raised by the Pittsburgh & Western was of the contemptible unfair kind that makes the business of free interchange of cars so difficult.

The Cincinnati, Hamilton & Dayton had to appeal to the Arbitration Committee against the Cincinnati, New Orleans & Texas Pacific in a case practically parallel to that of the Lake Shore against the Pittsburgh & Western. The decision was the same.

An accident happened on the Chicago, Burlington & Quincy Railroad at Chicago last month by a train belonging to the road running into an Illinois Central train. Two men were killed. The coroner's jury have returned a verdict strongly censuring the company. They say: We find the accident to be the result of gross carelessness on the part of the Chicago, Burlington & Quincy Railway company; and we also believe that the death of George R. Stout and Joseph G. French is due to the criminal carelessness of Harry G. Hoffman, the engineer of the Chicago, Burlington & Quincy train; J. E. Dumas, block-signal operator at Millard avenue, and William Turner, rear brakeman on the Illinois Central train, and we recommend that said Harry G. Hoffman, J. E. Dumas, and William Turner be committed to the County Jail until discharged by due process of law. We the jury, in view of the accident which occurred last summer at the same place on the tracks of the Chicago, Burlington & Quincy Company, and which caused such terrible loss of life, recommended that the State's Attorney present this matter to the grand jury at his earliest opportunity for their consideration.

The Rhode Island Locomotive Works have recently built a compound passenger locomotive for the Suwanee River Railroad system, and she is in service pulling the fast passenger trains on the New York, Providence & Boston Railroad. The engine is of the two cylinder type, and has the appliances necessary for working live steam in the low pressure cylinder at any time when the work to be done calls for the maximum tractive power. The intention is to run this locomotive on several of the railroads out of New York before sending her to the South. The motive power men of New England are considerably worked up about the performance of this engine, and she is imparting very valuable object lessons on the subject of compound locomotives.

Apropos of the discussion now going on about the practicability or advantage of using driver brakes regularly in the stopping of trains, the remarks of Mr. T. W. Gentry during a discussion on "driver brakes" at the Master Mechanics' Convention in 1889 will be found of interest. A member had favored using these brakes only in cases of emergency and Mr. Gentry objected to the practice. Continuing he said: All our passenger engines were equipped with driver brakes and they had the emergency feature. We found on investigation that in nine cases out of ten, the emergency feature failed to work. One fellow had a cow jump in front of him and he slapped the brakes on the train, but forgot the driver brakes. We had numerous instances to show us that the very best possible use we could get out of our driver brake was to have it applied every time we put brakes on our trains.

One of our Southern exchanges has lately waxed exceedingly enthusiastic over an invention for railroad purposes that is going to give a life-inspiring boom to the fortunate district where the invention was devised. The exchange referred to goes on to say that troubles have been experienced on all railroads in winter arising from the freezing of water tanks. A divinely inspired young genius of the fortunate district invented a cast iron box ordinarily $4 \times 2\frac{1}{2}$ feet which may be expanded to suit circumstances. This has merely to be put into the ground to a depth of four feet and the deed is done—all trouble ended. So says our exchange, and pronounces the thing a "magnificent success," but intimates that details would weary the reader. More important than details of the invention is the information given that a factory will immediately be built at Lynchburg for making the anti-frost box, which will give constant employment to 100 men.

Chicago & Northwestern Order System.

There is a very good system of requisitions for rolling stock material in use on the Chicago & Northwestern Railway. All requisitions for car or locomotive material are sent to the heads of the respective departments, and if granted are forwarded to the storekeeper to be filled and shipped. If the storekeeper has not got all the articles wanted, and they are made in the shops, he sends a request to have the articles made and shipped direct; a slip being supplied in which particulars of the things sent and time of shipment are entered. This direct shipment often saves valuable time, and the system regulating it prevents confusion liable to arise from dual methods of supplying material.

The orders sent to the store department for articles or finished material manufactured in the shops become the basis for the orders for manufacture during the succeeding three months. This is found to be a good plan for regulating manufacture, and prevents the running of machines too much on articles not likely to be needed soon.

When a shop order is sent in for any article, the different foremen note on it the time it has been received and the time the delivery was made, which prevents the common practice of one foreman putting upon another the blame for delay in getting out articles that have to pass through different shops.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

TARDY CAR MOVEMENT.

At the last meeting of the New York Railroad Club, Mr. W. G. Wattson, division superintendent of the West Shore Railroad, read a paper on Car Service Reform, which is worthy of more than ordinary attention. Mr. Wattson has evidently given the problem of moving freight cars comprehensive study, and he is inclined to advocate a somewhat original form of remedy for the existing evils that are keeping the average car mileage below twenty miles a day. Various remedies have been tried and abandoned as useless or impracticable. There was for a time great hopes entertained of the combined per diem and demurrage plan ably advocated by Mr. Albert Fink, but it brought very little relief. This was not, however, so much the fault of the plan itself as of the wretched discord between rival managers, that kept the majority of railroad companies from giving the scheme a proper trial. The plan has been tried again in modified form under the auspices of the Time Convention with very unsatisfactory results, and railroad men are now hoping for some relief from the labors of the Society of Railway Superintendents, who are trying to work the other system in connection with efforts to accelerate the movement of cars between the loading and discharging points. Mr. Wattson has evidently realized the difficulty of accelerating the freight trains on many roads, and he proposes that the railroad companies in certain geographical districts shall become owners of the cars in common, and thereby in a great measure save the mileage now made by cars returning home empty. He has concluded that an enormous saving would accrue to railroad companies from the general adoption of this plan.

The parent of an invention is liable to see its merits more distinctly than others, and Mr. Wattson has gone to the length of working out the details of his plan, so that he ought to realize its advantages and drawbacks better than others; but, we must admit, that we are not greatly carried away with it. We believe, in the first place, that is is impracticable to obtain the consent of the conflicting interests that must be brought into harmony in the forming of a company to control all the freight cars in a large district. In the next place, the benefit to be derived would not be a remedy of existing evils, but a relief similar to what is now obtained by companies overburdened with traffic, which are rapidly increasing their freight car equipment, while the cars in use continue to drag along over 20 miles per day, or less distance. The most discouraging thing to us about Mr. Wattson's paper is the fact, that a railroad superintendent who has studied the subject of car movement profoundly, and is receiving daily the practical lessons that the wrestling with car blockades imparts, can see no practical means of materially increasing the daily mileage of the cars in service. Car service reform is demanded, and a means of materially adding to the number of cars available for loading with freight is the panacea proposed. We have watched with keen interest the movement of freight on certain lines during the late busy season, and have found that trainmen were constantly on the edge of rebellion, owing to the incessant tedious delays they encountered in getting over the road. The reiterated complaint is "we are two hours in sidings for every hour we are running." Is this condition of affairs beyond remedy? We believe that the greater part of the delays could be prevented by proper management. When Colonel Ricker was general superintendent of the Central Railroad of New Jersey, he devoted his clear head to the systematic movement of trains, and certain freight trains were run regularly over a division in six hours. To-day the same class of trains seldom get over that same division in less than twelve hours, and yet since the punctual movement of these trains became a thing of the past, there has been great improvement in the machinery that ought to accelerate the movement of trains. We are very strongly of the opinion that the personal equation is in a great measure responsible for car service reform making such small progress in reforming.

CAN A SIMPLE LOCOMOTIVE BE MADE AS ECONOMICAL AS A COMPOUND?

Last week we briefly noticed a report that was published by the Rhode Island Locomotive Works, giving an account of tests made with simple and compound locomotives on the Brooklyn Elevated Railroad. During a test of 13¼ hours' work, when both engines were doing practically the same work, it was shown that the compound did the service on 37.7 per cent. less fuel than what was used by the simple engine. It was found that 23.3 per cent. of this saving was due to the superior evaporative performance of the boiler of the compound locomotive. The *Railroad and Engineering Journal*, commenting on this, wants to know why the boiler of a compound locomotive should be so much more efficient than the boiler of a simple engine, and urges that the simple engine be improved to bring about the conditions that effect the saving of coal with the boiler of the compound. Our contemporary says:

What the report shows now is that a compound locomotive working at a pressure of 155 pounds and an efficient boiler, burns less coal than a simple engine with 140 pounds pressure and an inefficient boiler. No one doubts this, but what we all want to know is how much coal will be saved by a compound locomotive working under the same conditions and with boilers of equal efficiency. What, we think, may be objected to is saving coal in the boiler, and then attributing the advantage to the compound principle of working the engine. It is admitted that if this economy of the boiler is due to, and dependent upon, the compound feature, that it is properly an advantage which may be claimed for that principle, but if the same economy may be obtained with a boiler of a simple engine, then it is not one of the merits of compounding. Thus it may be said, that the more economical working of the boilers is due to the lighter exhaust of compound engines. If that is so, it is an easy matter to make the exhaust of simple engine as light as we choose. It is not asserted here that compound locomotives are not more economical than simple ones, but the extent of the economy is a subject of dispute the world over. Don't let us be misled by experiments which are not conclusive.

Our experience with compound locomotives leads us to believe that the proportion of saving attributed to the boiler in the tests of the Rhode Island compound is considerably greater than what is generally found; but there is no question that an important part of the saving effected by a compound over a simple locomotive results from the increased efficiency of the boiler of the former engine. When we admit this and proceed to design a simple engine that will parallel the efficiency of the boiler of the compound and provide the same cylinder power, we find the problem exceedingly difficult to work out. If a compound engine develops certain power with a boiler pressure of 180 pounds to the square inch, and a simple engine with the same size of boiler carrying the same pressure has cylinders that develop about the same power as those of the compound the economical working conditions of these two engines ought to be equal. But experience indicates that they are not. The softened exhaust characteristic of the compound locomotive results principally from the exhaust steam being passed out of the cylinders at a lower pressure than the steam from the cylinders of the simple engine. If the attempt is made to reduce the intensity of the exhaust of the high pressure engine by opening the nozzles, failure of free steaming results and the attempted gain becomes increased loss. The thing might be accomplished by greatly enlarging the boiler of the simple engine, but that would be increasing the original expense and changing to what might be impracticable conditions. The experience of railroad men with simple locomotives carrying a high boiler pressure leads to the conclusion that the saving of steam effected by the rise of pressure above 140 pounds increases exceedingly slow. The decreased volume of steam called for by the cylinder of the compound locomotive in performing the work done by the simple engine increases the efficiency of the boiler, and has an effect equivalent to enlarging its capacity, since the drain of steam is reduced. We fail to see where the advantage that accrues to the compound locomotive in this way and results from the principle of the machine can be extended to the simple engine. From the experience we have had with locomotives with large and small wheels and all other parts the same, we are inclined to think that under certain limits slow exhausts tend to increase the efficiency of the boiler. There is a drop of the draft between each pulsation of the exhaust which reduces the velocity of the fire gases and permits them to linger in the flues for an instant when an increased portion of the heat is imparted to the water.

It is the legitimate province of mechanical engineers to investigate the exact cause of the economy of fuel that results from the use of compound locomotives, and it is right and proper that every effort should be made to find out if it is not possible to obtain the same results with a simple engine. This line of investigation and experiment was drawn out to wearisome length in the case of compound and simple marine engines, yet it was never satisfactorily demonstrated just why the compound engine saved fuel, although there are now few engineers inclined to doubt that a saving is effected. The performance of the compound locomotives on the Brooklyn Elevated Railroad and on other railroads throughout the Union, indicates that a material saving of fuel is effected by the use of compound locomotives. That is the important thing to railroad companies. How the thing comes about is a matter of secondary consequence. The advocates of improving the proportions of the simple engine to make the best possible use of high pressure steam have had their opportunity, and they have not shown that a saving of fuel worth mentioning could be effected by the employment of extreme boiler pressures. It is now only fair that we should accept the improved results effected by the use of compound locomotives as irrefragable facts, and not keep exclaiming, you could do as well by some other practice, when those who have tried the other practices have failed ridiculously.

DIAMETER OF SMOKE STACKS.

In the excellent paper which he read before the New York Railroad Club, Mr. A. E. Mitchell advocated the use of a uniform size of smoke stack for all locomotives with cylinders varying in diameter from 17 to 20 inches. This is the practice followed on the Erie system, of which Mr. Mitchell is mechanical engineer, and it is reported to give satisfaction. There is a certain loyalty to his company about Mr. Mitchell's recommendation which is pleasing to witness, but we are inclined to doubt its soundness as an engineering principle. We have been for years familiar with the practice of the Erie in regard to the diameter of smoke stacks, and although we did not consider a uniform size suitable for all engines, we refrained from criticism because no special claim of merit was made for the practice. But when the practice is offered to the railroad world as being worthy of imitation and adoption we consider it our duty to discuss the question.

When the diamond smoke stack and low nozzles with a lift pipe are employed, a few inches more or less in the diameter of the stack make little difference to the steaming qualities of a locomotive, and designers fell into the convenient rule of making the diameter of the stack about the same as that of the cylinders. When the open stack came into use, it brought with it new conditions in the regulation of the draft, for the stack had now to perform the functions formerly done by the lift pipe. Through force of habit, most designers applied the old rule to the open stack, and the consequence was that the diameter was too great for producing the best results, but an engine would generally steam better than she would with the old diamond obstruction, and efforts were seldom made to render "well enough" better. When this condition of affairs was prevalent, the mechanical department of the Erie tried a smoke stack considerably smaller than the forms previously in use, and it improved the steaming of the engines so decidedly that it was determined to adopt a small size for all the engines belonging to the system. The desire for uniformity led to the using of one size of stack for all locomotives that had cylinders between the range of 17 and 20 inches diameter.

We have no doubt that a great improvement was effected by the Erie in adopting the small stack, but observation convinces us that the benefit would have been greater had the size of the stack been regulated to suit the size of the engine. Some mechanical engineers, who have experimented largely with locomotives for the purpose of establishing proportions of different parts, insist that a close relation exists between the grate area, the area of opening through the flues, and the diameter of the smoke stack. When the proper proportions are maintained the engine will steam with the least possible velocity of gases, which means that a large nozzle can be used and the gases will pass through the flues at a comparatively slow speed, permitting the maximum share of heat to be absorbed by the water inside the boiler. In other words, the boiler will be made to attain its greatest efficiency as a medium for generating steam. The large nozzle employed will also ensure the easy exit of the steam from the cylinders and tend to increase the efficiency of the locomotive as a steam engine. When the proper proportions of stack and grates are not maintained, closing of the exhaust nozzles must be resorted to as a means of keeping up steam. This is done by forcing the fire gases through the flues rapidly, and results in useless waste of heat through the smoke stack. The reduced nozzles also detract from the efficiency of the engine by causing back pressure.

There is so much difference in the grate area of engines with the extremes of 17-inch and 20-inch cylinders, that it

is very unlikely that a common diameter of smoke stack will be well proportioned for both. The big passenger 10-wheel engines used by the Erie Company have 6,150 square inches of grate area. A common grate area with 17-inch cylinder engines is 2,550 square inches. If the same stack is used with both, its opening is in one case as 1 : 14 of the grate area, and in the other as 1 : 35. Some point between those extremes may be just right. In that case the large and the small engines have stacks that are not calculated to produce the best results.

Keeping the parts of as many engines as possible interchangeable is an excellent practice; but it is not difficult to carry a good thing too far. Experience, experiment and theory all seem to indicate that it would pay the Erie people to carry in stock three sizes of smoke stacks instead of one. Nearly all railroads that are using the open stack make it too large. If they make its opening about $\frac{1}{18}$ of the grate area they will be nearly right, but we would not advise them to regulate their stacks according to cylinder diameter or to make one size of stack for all engines.

ADVANTAGE GAINED BY THE BEST OF ROLLING STOCK.

It appears to be the fashion at present to attack the Chicago, Burlington & Quincy Railroad, and to underestimate the value of the securities of the company as an investment. Stock broker speculators have taken the lead in this, and others follow, actuated by a variety of motives, a certain class of small-fry journals being ready to descry what they consider a weakling, and to snarl at what appears to be a badly wounded lion. But the railroad is no weakling. Misfortune appears to have clung to the company since the great strike, but in spite of that the Chicago, Burlington & Quincy is in the position to-day to haul a ton of freight or passengers for less money than any railroad west of Chicago. Given the traffic to be moved, and after that the primary basis of prosperity of a railroad company is a good track, and well-designed rolling stock kept in good order. The Chicago, Burlington & Quincy have as good a track, and as easy grades as any railroad west of Chicago, and they are far ahead of the other roads in the kind of cars and locomotives required to carry freight or passengers economically. During the last ten years the capacity of freight cars has been about doubled. While the change was going on that placed upon the same number of wheels double the load previously carried, all the managers of railroads running westward out of Chicago, with the exception of the management of the Chicago, Burlington & Quincy, persisted in pursuing the policy of purchasing or building small locomotives that were out of proportion to the increase of car weight. For this short-sightedness the heads of the mechanical departments were in a great measure to blame, since they advised the use of small locomotives, and, in some cases, are still prepared to advocate the same practice. The management of the Chicago, Burlington & Quincy, on the other hand, employed progressive men, who perceived that it was necessary to keep pace in the size of locomotives with the increase in the capacity of cars. The result is that the company have gradually worked into locomotives capable of hauling from 40 to 50 cars on low grades, while their neighbors were contented to keep in use engines with from 25 to 100 per cent. less hauling capacity. For the last three or four years the rival companies, after long "standing with reluctant feet," have been gradually adopting the progressive policy of the Chicago, Burlington & Quincy, but it will take much expenditure of money and energy to catch up with the company that has obtained the lead.

There are many railroad officers still to be found in active service who believe that an eight-wheel locomotive is large enough to haul any train that ought to be handled on a prairie railroad. Yet it can easily be shown that the cost of moving freight can be reduced from 15 to 40 per cent. by employing larger engines. This being the case, the man who urges the employment of small engines is an expensive and incompetent adviser to a railroad manager. There is an impression among railroad managers that the conservative, slow to move master mechanic is a safe man to take advice from. In some cases this may be correct, but when it comes to figuring on the means of moving a ton per mile at the least possible cost, the conservative man is a weak adviser; he is too much devoted to ancient idols.

UNFAIR INVESTIGATIONS OF ACCIDENTS.

When a railroad accident happens there is somebody to blame for it. If investigations of all serious accidents were made by competent men, the blame would be placed where it belongs, and the resulting publicity or punishment would have a tendency to increase the sense of responsibility of these connected directly and indirectly with train operating. Under the present loose system of dealing with accidents, the blame is seldom saddled on the right shoulders and those guilty of the most careless and reckless practices cause loss of life with impunity. The coroners jury, that is usually intrusted with the duty of investigating the cause of an accident, may confidently be depended upon to bark up the wrong tree when they send forth their voice of censure. The ordinary State Railroad Commissioner appears to be as successful in blundering as the coroners juryman, although there is a notable exception in the Massachusetts Railroad Commissioners who have repeatedly displayed willingness to investigate thoroughly the real cause of accidents, and ability to carry out the work strictly and judiciously. Their investigation of the Old Colony accident and their report thereon is likely to result in increasing the safeguards of travel, not only in Massachusetts but in every state in the Union. If the labors of a railroad commission are not calculated to increase the safety of passengers or result in benefit of some sort to the people of the state paying the commissioners' salaries, the expense is a useless waste of money.

The fair, searching and judicious investigations into the causes of railroad accidents for which the Massachussetts Railroad Commission is noted, is in very decided contrast with the work done by the Railroad Commission of New York State. The constant aim of the latter board in investigating accidents appears to be the finding of excuses for putting the whole blame upon the railroad companies. We admit that the railroad companies are generally to blame for accidents, but there are times when they are not at fault, and when this is the case, it is the duty of the Railroad Commissioners, who are the servants of the people, to arrive at the truth and to report the facts impartially. We have seldom seen this duty more grossly violated than it was by the Railroad Commissioners of New York State in a report on an accident that happened on the New York Elevated Railroads.

On January 11 a collision happened on the Third avenue Elevated Railroad by which a locomotive was thrown into the street below. It was caused by a switchman opening a switch to admit an engine across the track at the time a train was approaching. The engineer of the approaching train ran past the danger signal that was automatically thrown when the switch was opened, but he was almost on it when the signal was turned. Both switchman and engineer had excellent records. On investigation the general manager of the company decided that the accident was caused by a mistake in judgment on the part of the switchman, inspired by zeal in trying to get the engine that caused the trouble sent to her destination, and there was doubt about the engineer being to blame at all, so both men were restored to duty. In their report on the accident, the Railroad Commissioners put the entire blame upon the railroad company. They recommend the establishing of rules that are already in force, and urge as improvements changes that would increase the danger in operating these roads. During the investigation Commissioner Rickard acted as if he were an attorney employed to throw the blame upon the railroad company. All fair-minded men capable of judging will admit that the elevated railroad management have provided the most improved appliances and employed a highly efficient class of men for securing safety in operating. This is all that forethought, care and skill can accomplish. When this is done and an accident happens through the human fallibility that can never be eliminated, even that Pariah of New York demagogues, the Manhattan Railroad Company, ought to be treated justly.

WHO IS TO BLAME FOR THE SMOKE NUISANCE?

For years past there has been a constant conflict going on between the municipal authorities of various cities and steam users respecting smoke. Those responsible for the health and cleanliness of cities object to the smoke that is constantly poured out from the smoke stacks of all sorts of furnaces, and those running the coal burning plants allege that the preventing of smoke is impracticable. Bituminous coal cannot be burned without the emanation of some smoke, but different forms of mechanical stokers, and good firemen working on properly designed furnaces demonstrate daily that the quantity of necessary smoke is not sufficient to cause injury to health or discomfort to neighbors. The boiler owners who make the greatest clamor against municipal interference with smoke nuisances are those who do the least toward abating the evil. Men who have badly designed furnaces that are constantly forced to generate the necessary steam, and men who employ ignorant and unskillful firemen are the people who make sure that the agitation against smoke nuisances shall never entirely subside. Not a few railroad master mechanics help to exasperate the public against smoke and railroad companies at the same time.

There are hundreds of men who have fired locomotives for four or five years and then been promoted to run the engines, who have never been told that smoke could be prevented, or that excessive volumes of black smoke passing from the locomotive is objectionable, or in any manner a reflection on the men in charge. A few months ago the writer happened to be waiting at a junction of one of the leading railroads running into Chicago, and a freight engine that was standing on a siding was pouring out a stream of inky smoke which filled the waiting rooms and caused decided discomfort to the people therein. We interviewed the engineer and delicately drew out his sentiments on the subject of smoke. He allowed that 65 was one of the worst smoking engines on the road, but otherwise she was a dandy. In answer to a direct question he admitted that he did not know how the smoking tendencies of the engine could be reduced, not even how it would be possible to lessen the quantity of smoke passing to the train platform except by moving the engine, which was done shortly after our talk. Yet all the time the dampers of the engine were open, and the firebox door closed. The question is, who was to blame that this engineer did not know that by closing the dampers, opening the fire door slightly and starting the blower a little, the smoke would have cleared away in an instant? Undoubtedly the head of the mechanical department. It is a suggestive circumstance that the locomotives belonging to this road are conspicuous in Chicago yards for the quantity of smoke they pour upon the city. This is the sort of business that gives influence to the operative officers, who recommend taking everything away from the mechanical department beyond the executing of repairs. When the managers of railroads talk of adopting the use of hard coal or coke for their engines running into cities, they are generally imputing that the head of their mechanical department is incompetent.

VERTICAL PLANE COUPLERS IN NEW ENGLAND.

At the January meeting of the New England Railroad Club a large number of railroad men met for the purpose of discussing the question of "What constitutes a defect in a vertical plane coupler," and it led to a remarkably free expression of opinion respecting the defects generally of the Master Car Builders' standard type of coupler. Several of our contemporaries are inclined to treat what was said with levity, but had the writers of the articles ridiculing the speakers been present, they would have been convinced that there was very little to excite mirth about the question as presented at that meeting. It was a meeting of earnest men, representing the railroads in a wide geographical area, who are in the best position to judge of the behavior of the couplers in service. Their object in coming together was to try and devise an arrangement which would reduce the number of cars delayed owing to defects in the vertical plane coupler. No sentiment appeared to actuate them beyond that of working for the best interests of the companies they represented. The unanimous opinion expressed by those men was, that the vertical plane coupler was dangerous, and that it excessively increased the cost of maintaining freight cars in running order. The vertical plane coupler has been adopted by the railroad companies represented by some of the speakers, yet the opinion was freely expressed that it could not be made a success. The opinions of the men who made statements of this kind are certainly as much worthy of consideration as the views of their critics.

The decision arrived at, that it was the course of wisdom to follow Mr. Buchanan's lead in refusing all cars having couplers of the vertical type with any defect whatever, is a move that is really calculated to help the vertical plane coupler to work its way into popularity. The practice that prevailed before the order referred to was issued, of accepting cars with knuckles broken or absent, was doing more than the inherent weakness of the coupler to bring it into disrepute. When a car was accepted in this condition it was coupled with a link and pin by the jaw, and a little rough usage in the next yard seldom failed to break to pieces the whole of the draw-bar.

The stenographer's report of the New England Club meeting leaves out several statements made about the proportion of cars having the vertical plane coupler that passed over the Boston & Albany Railroad during the time the cost for repairs was collected. According to these unpublished figures, it cost the company or the owners of the cars about $4 per car in three months for the repair of the couplers alone. It was not then known that the owners of the Janney car coupler were prepared to enter into contracts to keep their couplers in repair for one dollar a year per car, or a less despondent view of the situation might have been taken by the speakers.

The problems worked out in another column by Mr. L. R. Pomeroy, showing how to determine the length of the radius bar of a mogul or consolidation locomotive, will be of valuable service to designers. A great deal of ignorance has prevailed even among designers of locomotives respecting the proper length of the radius bar, and many locomotives are running that have this important connection of the pony truck considerably away from the proper length. Mr. Pomeroy has devoted a great deal of attention to the subject of pony trucks, and besides giving the most approved formulas for finding the correct radius, he has given the lengths in use on some of the principal roads where the best designing practice prevails. It will be seen that the radius bars used on the locomotives of most of these railroads coincides very closely with the correct length as figured out by the rules given.

In our correspondence columns will be found an interesting letter from a Kansas City car foreman describing the method of joint car inspection in use at Kansas City. The letter describes the working of the system very clearly and comprehensively. Kansas City is a very important interchange point, and a system that works there satisfactorily ought to work well anywhere. In one respect we do

not like the system at Kansas City. It is operated under the control of an association of superintendents. There are many things connected with car interchange that can only be decided fairly by men having mechanical training, and for this reason we think that a system of joint car inspection for any district ought to be controlled by the master car builders or superintendents of motive power of the roads represented. The description of the Kansas City plan of joint inspection is, however, well worthy of the careful study of those who are working to devise improved methods of car inspection for large interchange points.

The Chicago & Northwestern Railroad had a curious dispute with another railroad company lately which was nearly becoming a question for the Arbitration Committee. This company has been in the habit of taking cars from another railroad company to be placed on a private siding that is not in charge of the C. & N. A number of cars that were on this siding had the journal brasses stolen, and as there was no inspection at the siding the C. & N. took the cars out and offered them for delivery to the company owning them. Pulling the cars without brasses had caused some of the boxes to heat, and the car inspector of the road owning the cars discovered the absence of the brasses and refused to accept the cars without a card. The question arose, who was responsible for the stolen brasses? We think the owners of the cars were in equity responsible, but others say that the Chicago & Northwestern were responsible because their switchmen did not ascertain the condition of the cars before taking them out of the siding. We should like to have the opinions on the question of our readers versed on car interchange matters.

The *Manufacturers' Record*, of Baltimore, has published in pamphlet form the Hon. Edward Atkinson's masterly review of the iron and steel trade. The article deals so relentlessly with facts and figures which cannot be condensed that a short review of the pamphlet is not likely to do the subject justice. Those interested in the development of the iron industries or in their present status and their influence on the future of this country ought by all means to study Mr. Atkinson's article.

Proceedings of the Master Car and Locomotive Painters' Convention.

We have received from Secretary McKeon the bound proceedings of the twenty first annual convention of the Master Car and Locomotive Painters' Convention held at Boston in September last. The report contains copies of all the papers read at the meeting and the discussions thereon. Among the subjects under consideration were: Is it a benefit or a detriment to an under coat of paint to have an egg-shell gloss? What is the best way to test the quality of japan before mixing into paint? Should hard and soft woods be primed or treated alike to make a lasting job of painting? What is the best one coat of paint that will hold rust back the longest? Which color will show up the best on a locomotive tank after eight or ten months of service, ivory black, lamp black or Brunswick green? What is the best and quickest method of removing old cracked and scaly paint from engine driving wheels, domes and rough castings? The information given on these and other subjects is practical, clear and valuable. All railroad men in any way interested in the painting of cars and locomotives ought to make themselves familiar with this report. It can be obtained from Mr. Robert McKeon, Kent, O.

NEW PUBLICATIONS.

PRACTICAL BLACKSMITHING. Compiled and edited by M. T. Richardson. Published by the *Blacksmith & Wheelwright*, New York.

This is the third volume of articles on blacksmith compiled by Mr. Richardson, and is devoted principally to the description and illustration of blacksmith's tools and to various blacksmithing operations. There is also a chapter on steel and its uses, which contains a great deal of information about the hardening, tempering, annealing and working of tool steel. The data given had all previously passed through printers' ink, but in this book it is in convenient shape for reference. There are few of our best tool makers who will not find useful information about steel in this chapter. A considerable part of this volume is devoted to the forging of iron and the illustrations of the tools used, and the operations described are highly interesting and will be found useful by most blacksmiths. Every blacksmith who takes an interest in the progress of his trade ought to read and study this part of the book with care. A succession of pages are devoted to the illustration and description of different methods of forging a locomotive valve yoke. Various other difficult blacksmithing operations are described.

VALVE GEARS, by H. W. Spangler, professor of mechanical engineering in the University of Pennsylvania. Published by John Wiley & Sons, New York.

In the preface to this book the author says that it was prepared because he needed a book for class work that contained in one volume those parts of the theory of valve gears necessary to a clear understanding of the subject. The current periodicals and all the best authorities on valve motion were called on for data and methods. The result is a work that contains in convenient compass the most valuable methods of designing various forms of valve gear, including the common slide valve operated by an eccentric, different kinds of link motion, radial gears and all others of any consequence. The book will no doubt be useful for engineering schools where mathematics and mechanical studies are closely combined, but the explanations are too much involved in difficult algebraic formulæ to obtain popularity among working engineers. It is of no use to men who are not well acquainted with algebra and trigonometry.

Personal.

Gen. G. M. Dodge succeeds Charles Francis Adams as President of the Union Pacific, Denver & Gulf Railroad.

Mr. Andrew McCallum, general counsel of the Eastern Railroad Association, died at Washington, D. C., on Jan. 14.

Mr. Charles R. Whitman, regent of Ann Arbor University, has been appointed Railroad Commissioner of Michigan.

Mr. Edward Dawson has been promoted to the position of general mechanical foreman of the Chicago & Northwestern Railway at Council Bluffs, Ia.

Mr. Chas. Graham, Jr., takes charge as Master Mechanic of the Bloomsburg Division of the Delaware, Lackawanna & Western. We bespeak for him a promising future.

Mr. William Hutchinson, general mechanical foreman of the Chicago & Northwestern, at Council Bluffs, Ia., has been promoted to a similar position at Eagle Grove, Ia.

Mr. J. F. Deems has been promoted from the position of foreman of the Aurora shops of the Chicago, Burlington & Quincy to master mechanic of the middle division.

William Penney, the veteran engineer of the Maine Central, is over 80 years old, and, until the present winter, has made his runs regularly. He is now quite ill at his home in Waterville.

Mr. F. A. Stinard, a member of the Master Mechanics' Association and well known among railroad men, has taken charge as manager of the United States Metallic Packing Company at Chicago.

Mr. W. H. Whitaker, who has been acting master mechanic of the Minneapolis & St. Louis since Mr. Wilson left, has been appointed to the position. He was for several years general foreman of the shops.

Mr. P. Wallis, who has been for the last three years master mechanic on the Chicago, Burlington & Quincy, has resigned. Mr. Wallis was engineer of tests before being promoted to the position of master mechanic.

Mr. John T. Rich, who has been Railroad Commissioner of Michigan for several years, has retired, through his term of office having expired. No railroad commissioner whose career we are familiar with has acted more fairly than Mr. Rich between the people and railroad companies.

Mr. Fred. Mertzheimer, for some time superintendent of the Cheyenne division of the Union Pacific, has been appointed assistant superintendent of motive power of the road, with charge of the Cheyenne shops. Mr. Mertzheimer is an able mechanical man, and he is liable to be lonesome on the Union Pacific.

Mr. Joseph H. McConnell has been appointed superintendent of motive power of the Union Pacific, to succeed Mr. Harvey Middleton, resigned. Mr. McConnell was formerly a master mechanic on the Union Pacific, but resigned during the Adams' management. His father was one of the first employees of the company.

The following are the officers elected by the Northwestern Railroad Club: President J. O. Pattee, Great Northern; First Vice-president, Wm. McIntosh, Chicago & Northwestern; Second Vice-president, J. C. Barber, Northern Pacific; Third Vice-president, W. H. Whitaker, Minneapolis & St. Louis; Secretary, H. P. Robinson, *Northwestern Railroader*; Treasurer, H. L. Preston, St. Paul, Minneapolis & Omaha.

Mr. Peter A. Dey retires from the Board of Railroad Commissioners of Iowa, and is succeeded by Mr. J. W. Luke. Mr. Dey was originally appointed in 1878, and although a democrat in politics he was chosen by a republican governor because he was a railroad civil engineer, a successful business man, and one likely to act fairly between the conflicting interests of the people and of railroad companies. His successor was appointed because he does not know anything about railroad matters and is likely to treat the companies as harshly as possible.

Mr. Robert Erskine has been appointed Master Mechanic of the Galena division of the Chicago & Northwestern Railway, with headquarters at the West Chicago shops, which will be under his charge. Mr. Erskine has been for several years general foreman of the company's shops at Eagle Grove, Ia., and is a practical railroad mechanic of mature experience.

Mr. George D. Brooke has been appointed master mechanic of the St. Paul & Duluth. Mr. Brooke has been for the last few years foreman of the car department of the Burlington, Cedar Rapids & Northern. Before that he was master mechanic of the Chicago & Atlantic at Huntington, Ind. He is a pupil of Mr. Jacob Johann, and does credit to his old preceptor.

Mr. Samuel Sloan is a millionaire several times told, and he accumulated all the fortune by his own exertions. He says that the proper way to get rich is to make money and keep it. He is very saving in his habits, and is said to preserve all envelopes of letters received to make scroll pads of the clean side. Mr. Sloan is not popular with the passengers who ride on the Delaware, Lackawanna & Western, of which he is President. He tells people that it is a freight railroad, and that he does not care for passengers. Some of the leading men of Orange once presented a memorial to Mr. Sloan asking for increased accommodation for the suburban trains. In the answer he intimated that he liked better to carry dead hogs than live ones.

Mr. John D. Campbell, superintendent of transportation of the Manhattan Elevated Railroad, has resigned to accept the position of assistant superintendent of motive power of the New York Central. Mr. Campbell is one of the ablest mechanical engineers of our acquaintance, and with many others we have felt keen regret all the time he has been away from the mechanical department. He was brought up on the Erie, and from there went South and eventually went with Colonel Ricker to the Central of New Jersey, where he was general foreman of the Elizabethport shops. When Colonel Ricker left the road Mr. Campbell went to the elevated railroads, and was for years superintendent of the repair shops. He was one of the best shop managers we have known.

Mr. C. F. Ward, who has been for the last four years master mechanic and car builder of the St. Paul & Duluth, has resigned to accept the position of master mechanic of the Gulf, Colorado & Santa Fe. Mr. Ward had spent several years in the South before going with the St. Paul & Duluth. He had commanding ability in the art of making something out of nothing, which helped him to make his mark on the collection of scrap heaps he found taking the place of locomotives on the St. Paul & Duluth. The biggest accumulation of dilapidated antiquities which he met with, however, was in the place the company called their machine shop. He succeeded, however, in working order out of chaos, and the company gave him credit, if not pay, for the work accomplished. He leaves a good friend in General Manager Plough.

Mr. Chas. Graham, for many years Superintendent Motor Power of the Delaware, Lackawanna & Western at Scranton, finding himself unable, on account of continued illness, has resigned, to be succeeded by Mr. Joseph Brown, who for many years has been general foreman under Mr. Graham. Mr. Graham remains with the road as consulting Master Mechanic during his life, which is a very handsome compliment to his many years of faithful and efficient service to the company. Mr. Graham has been one of the ablest master mechanics in the country and he has repeatedly been offered highly remunerative positions in engineering establishments, but he preferred to remain with the Delaware, Lackawanna & Western. The physical trouble from which Mr. Graham is suffering originated in an accident. He was struck by a locomotive about nine years ago and received injuries to the base of the spine from which he has never entirely recovered.

Mr. Frank S. Gannon, general superintendent of the Staten Island Rapid Transit and of the Baltimore & Ohio Eastern terminals, is a graduate of the Erie, and is proud of it. We happened to be afflicted lately by being an outsider very lonesome in a love feast where Gannon and John D. Campbell glorified the pasture of their calfivity, the Erie, and Frank Coolbaugh encouraged their boastings and edged in a word for the Delaware & Lackawanna. After exercising their imagination finding commendable practices in the operating of the roads, the trio finally settled down to comfort each other with the assurance that the two railroads mentioned were the training schools for all the men who went to other companies, and showed them how a railroad ought to be successfully run. They made out that no railroad on the continent was ever managed decently until an Erie or Delaware & Lackawanna man got there, and showed them how the thing was done. The curious thing about it all was, that these men contrived to make themselves believe that they were not romancing.

Communications.

Joint Car Inspection at Kansas City.

Editor National Car and Locomotive Builder:

I notice in your last issue considerable about joint car inspection. As I see nothing from the West, I will try and give you a brief description of the system in use at Kansas City, which appears to work very successfully.

There is an association formed known as the Association of Superintendents of Kansas City Railways, composed of superintendents, assistant superintendents, train masters and resident general agents of Kansas City railways.

The officers of the association are a president, vice-president and secretary, each of whom are elected by ballot, each railroad having one vote, to be cast by the ranking officer. Article 13 of the association reads as follows: "The M. C. B. rules as they now are and as they may be revised from time to time shall be the basis of settlement between the companies or the firms represented in this association."

The Joint Car Inspector is elected by ballot of the association, and is allowed one assistant inspector and three clerks, whose duty it is to keep a record of all cars interchanged between the different roads. All stationery pertaining to the joint inspecting is furnished from the joint office.

The total salaries of the joint office amount to $365 per month. The cost of stationery is added to this, which expense is divided equally between the different roads belonging to the association. Each company employ their own inspectors who are controlled by the car foreman; but any inspecter not doing right, the Joint Inspector may ask his removal, and the car foreman is supposed to give due consideration to such request. We have never had any such occurrence here.

The delivering road takes inspection of cars only as they arrive in their yard from the road; such inspection is not taken in the joint office. The receiving road takes the inspection, and condition of the cars is taken in a small receiving book furnished by the joint office. This book must be returned to the joint office before 8 A. M. to be recorded by the joint clerk. The inspector has two of these books, so that he can have one while the other is being copied. There is a rule, and a very good one too, that compels the receiving road to either take the car or take the load. In case a car is in such bad condition that the load must be transferred, the receiving road must pay for transferring, which will often prevent unnecessary transferring. If the receiving road elects to repair any car delivered to them, they may make bill for the repairs against the company delivering the car, such bills to go through the joint office for approval at the end of each month. These bills will run in number from 75 to 300, according to the amount of business done, and will average about $1.50 each.

Being compelled to take cars and bill for work done saves a great amount of switching back cars for small repairs, thereby causing blockades in yards. In billing against each other they will even themselves up and not amount to much. Each bill is thoroughly inspected by joint inspector before being approved.

BAD ORDER CARDS.

When a train or transfer arrives in a yard, the inspector will place bad order cards on cars condemned, of which there are three kinds, *red*, *white* and *yellow*. The red card shows the car must be placed on repair track before delivering to any other road; the white card shows the car must be placed on repair track when empty, and the yellow card shows that the car is to be sent back to the delivering road when empty.

CONDITION CARDS.

There are two kinds of condition cards and they are all issued and signed by the joint car inspector. One is the M. C. B. card, such as is used the country over; the other is called a pass card and is used on foreign cars. This card may be used by the local inspector, but he must leave a record in the joint office of any such card used. This card must be returned to the joint office to be approved before it becomes a voucher for a bill. This card is only used on foreign cars that do not belong to the road receiving them. What I mean by this is, a company bringing a foreign car to the city and delivering it to another road, when returned to them it is supposed to belong to the road bringing it to the city. On such cars the pass card is not allowed to be used but when a foreign car is received, that is supposed to be returned; or, in other words, the pass card can be used on a car that has not been on the line before.

WHY A PASS CARD MUST BE RETURNED TO THE JOINT OFFICE.

To illustrate: A car may be delivered to the U. P. Ry. by the Mo. P. Ry. with some defect. The U. P. inspector will take notation in his receiving-book and record it in the joint office. The car will go from the U. P. Ry. to K. C., F. S. & M. Ry., and they will do as the U. P. Ry. did, record the defect in the joint office. The K. C., F. S. & M. Ry. give the car to C., R. I. & P. Ry. for Eastern points, the C., R. I. & P. inspector will place a pass card on the car for the same defects, chargeable to the K. C., F. S. & M. Ry. When this work is done and the card returned to the joint office for approval, the Joint Inspector traces the car up, and finds that the Mo. P. Ry. are responsible for the repairs, consequently they cancel the pass card and issue an M. C. B. card direct against the Mo. P. Ry. The pass card often saves delays to foreign cars.

If at any time a company think they are misused by the Joint Inspector's decision, complaint is made to the Association of Superintendents, who take up the matter at their first meeting. They meet the second Tuesday in each month, and the Joint Inspector must make a report to them each meeting.

A KANSAS CITY CAR FOREMAN.

Rival Plans of Joint Inspection.

Editor National Car and Locomotive Builder:

Probably this argument has been carried far enough to suit you and the readers of your valuable journal, still, I will ask permission to occupy a very small space once more.

"P." says I undertook to answer his article in the November number. I will acknowledge I am at a loss to answer his communication if I can call it such. Many would undoubtedly wonder why it was not among the editorials, as it dealt nearly altogether in generalities. I think "P." must be a politician as well as in the railway business, as the issue is dodged with cleverness and despatch. He says that interchange points have been changed from the Buffalo plan to the Detroit, but does not give any reason; was it because cars had to be in good shape before they could be delivered, and made too many cars for the shops? This is likely to cause dissatisfaction to car foremen as soon as any thing I know of. Our experience here does not go to show (although two inspections are required) that the cars are in better condition than where received from points where the Buffalo plan is in vogue.

Another question which, if not dodged, is certainly not clear to the average reader; that is, if a company delivers cars in one yard and receives in another, how one set of inspectors can do the work? Or, even in the same yard, the east bound will be on one side and the west bound on the other. Now, if "P" could have trains arrive at proper intervals from both ways, this scheme would work very nicely; but, unfortunate as the case may be, trains very often arrive in such close proximity that before one train is inspected another is waiting. As nearly all companies have a number of fast freights, it would be rather perplexing to the average inspector to tell whether best to keep right on inspecting cars to be delivered to connections, or whether the second inspection should claim his attention to see if cars going over the road on which he is employed are in a proper condition, or in such a shape that no fault could be found with them, or to try and get square with some grievance perpetrated on cars offered for delivery.

Referring to the breakage from one yard to another, this is confined principally to the draw attachments and can be easily detected by the oilers who are generally, and I might say universally, instructed to look after defects of this kind. Referring again to the changing from the Buffalo plan to the Detroit as "P." puts it, we always styled the two inspections the Buffalo and Toledo systems, as it was first introduced at that point. It is well, however, that "P." substituted Detroit, as I understand that the Detroit system at Toledo is about to be reconstructed, and will, when finished, have largely the appearance of the Buffalo type of inspection. J. C.

[We do not think that our readers are anxious to hear any more on this subject at present, so we will permit the discussion to close.—ED.]

Railroad Management.

Editor National Car and Locomotive Builder:

Simplicity is nearest to truth in all cases. What is more simple and judicious in railroad management than this formula: Carry as little as possible of non-paying weight, and at the same time as much as possible of paying weight. Railroads generally seem to have reversed this evident proposition, and carry non-paying weight far in excess of paying weight.

Any one that could rectify this state of things should be welcomed by all—

Because he would be directly a benefactor to the roads themselves, and as a legitimate consequence to the public in general.

Facts, tangible facts, justify the undersigned in asserting that the above results can be produced by his system of construction for the rolling stock of railroads, as any judicious examination of his plans will fully demonstrate; the main object being in the first place to reduce expenses; and in the second place to increase the receipts, and particularly to insure great safety and comfort in railroad travel.

Making passenger cars fire proof, splinter proof, and even telescope proof.

To demonstrate the above, we have only to consider that in these United States there are over 1,000,000 cars. Let us say 1,000,000 cars. The freight cars included in this number weigh on the average two tons (4,000 pounds) more than necessary, and the passenger cars of all kinds from 8,000 to 14,000 pounds more than they should.

What is the consequence of all this, or the actual expense of carrying this superfluous, non-paying weight at only ½ cent per ton per mile? Let us see: 1,000,000 cars × 2 tons = 2,000,000 tons; 2,000,000 tons ½ cent per ton per mile = 1,000,000 cents = $10,000 for one mile run. Suppose the cars run on the average 30 miles a day (some cars run 300 miles), $10,000 for one mile run × 30 miles = $300,000 for one day run.

$300,000 × 365 days = $109,500,000 saved in one year by non-carrying that superfluous dead weight.

In addition, let it be well understood that with the system of construction, secured to the undersigned by various patents, the cars are not only lighter and stronger, but they are also of greater cubic capacity, without increasing their external dimensions, because the sides and top are much thinner than those of the cars now in use.

In fact, with these cars four trains could easily do the work of five trains by simply transporting paying weight in lieu of the useless dead weight now carried.

Railroad men will comprehend this last advantage better than it can be here stipulated. B. J. LA MOTHE.

NEW YORK, January, 1891.

[The writer of the above is the inventor of a steel car which he claims can effect the wonderful saving outlined.—ED.]

Room for Improvement.

Editor National Car and Locomotive Builder:

The dead lever on a truck can play sad havoc to a train, as was practically demonstrated the other day.

In boarding the San Francisco train which left Sacramento Monday morning, Jan. 12, at 6:15 a. m., we had not proceeded many miles before there was a sudden snap, or as if something had struck the car. The engineer slackened up; but as nothing was noticed, he opened the throttle and we rattled away at about 25 to 30 miles per hour, when I detected a strange scraping rumbling noise under the forward truck of car No. 87. Soon after it developed into knocks and thumps, I jumped up, pulled the bell cord, and went to the rear of the train to tell the conductor that something was wrong with our car, which was about the middle of the train. He called the brakeman, and together we went back to the car. By this time the train had stopped, and in looking at the forward truck we found the lower brake connecting rod had snapped off and curled up like a pig's tail, the brake beam twisted upside down and the dead lever top foremost scraping the ties. As luck would have it, we did not pass over any switches, for had we, it surely would have derailed half the train and caused the death of many persons.

I think the brake lever jaw should not be left open but should have a bolt in the last hole. Such a simple precaution would eliminate a source of decided danger.

S. A. OWEN.

WEST BERKELEY, Cal., January 16, 1891.

Central of New Jersey Draft Gear.

Editor National Car and Locomotive Builder:

The severe criticism on the draw gear of the freight cars belonging to the Central Railroad of New Jersey, published on page 1, January number of NATIONAL CAR AND LOCOMOTIVE BUILDER, 1891, will certainly lose much of the desired effect if the complete story is told.

The draw gear alluded to is found only on cars built 10 and 15 years ago, in other words, on old cars only.

For the last six years all cars of that class run into the shops for repairs have the objectionable draw gear changed. The draft sills are closed in to 8½ inches, a malleable drawhead is substituted, new draw timbers, sufficient strong follower plates, strap irons and bolts put in, making a good and substantial job.

There is certainly no necessity for finding fault with the Central Railroad of New Jersey's old style draw gear when the same, or in similar points, defective draw gears can be found on old cars of other large railroad companies. In regard to the last two lines of the criticism, it may be well to state that within the last two years the company has built 1,500 gondola and box cars of 50,000 and 60,000 pounds capacity, equipped with a draw gear that will bear inspection and Master Car Builder coupler, since same is acknowledged standard.

CHARLES STRICKER, Draughtsman Dudley Shops.

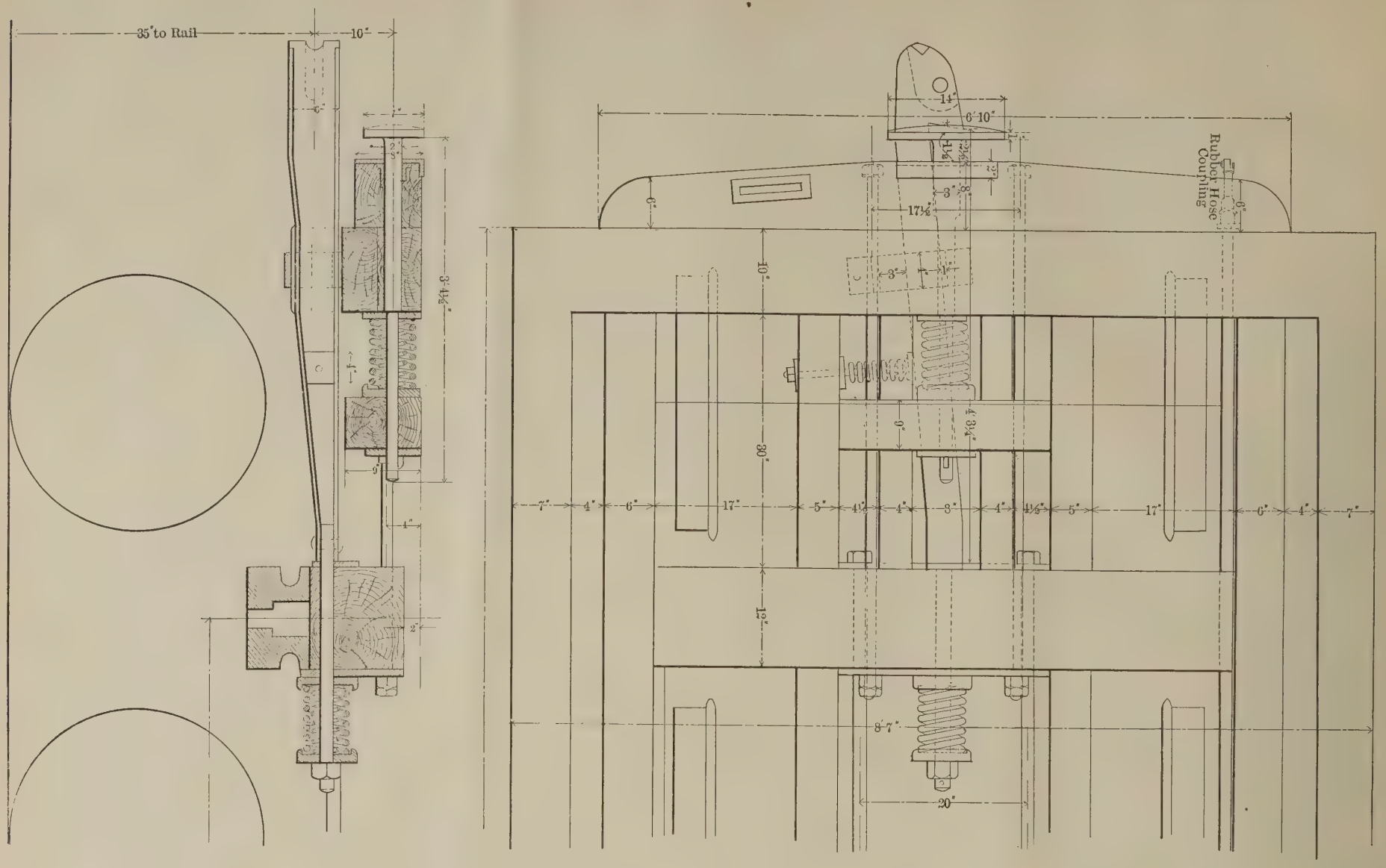
[We are very glad to publish this intimation that the railroad company named is doing its best to eliminate the source of danger which we have repeatedly received complaints about.—ED.]

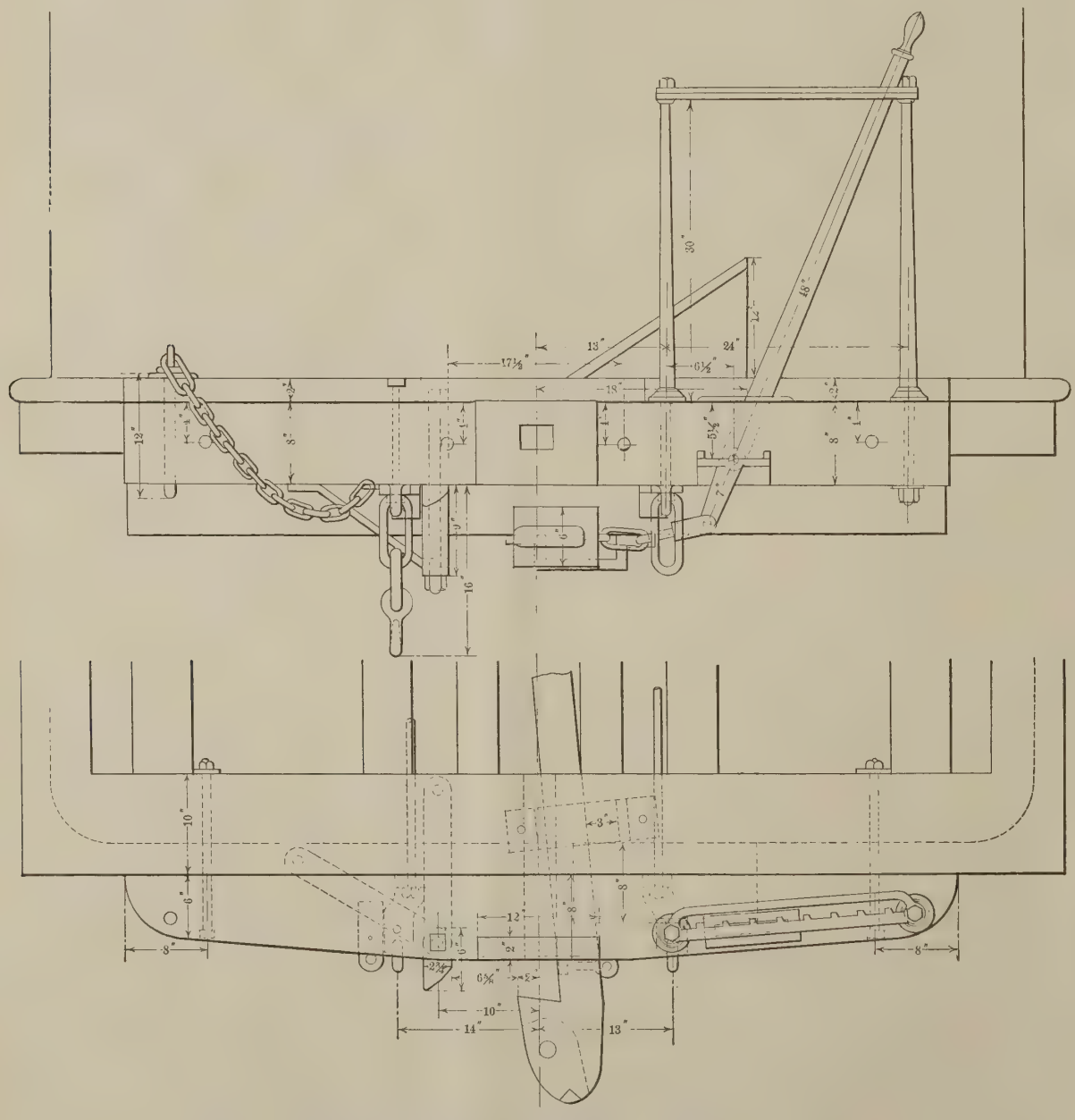
License v. Seniority.

Editor National Car and Locomotive Builder:

Referring to "J. C. C.'s" reply to "Reader" in the January number, and his remark, "What has a license certificate to do with good judgment and horse sense," I would like to ask him what he thinks "seniority" has to do with good judgment and horse sense? A man may be a senior and lack both these qualifications, as well as a man who has a license. Let us then have licenses for engineers and conductors, based upon seniority, and we will come nearer the proper thing. GEORGE B. NUTT.

PITTSBURGH, Pa., Jan. 5, 1891.





NEW YORK, NEW HAVEN & HARTFORD TENDER COUPLER.

The above engraving shows a form of coupling device for the back end of passenger locomotive tenders designed by Mr. John Henney and used on the engines belonging to the New York, New Haven & Hartford. It makes a very efficient form of close coupler, the same as that used with the Miller platform, and makes a continuous line of coupling throughout the whole train. The arrangement strengthens the draft rigging of the tender, and makes that part of a train as strong to resist shocks as the platforms between the cars. The improvement calls for very little additional work on the frame of the tender, and yet the mechanism for operating the coupler can be handled without difficulty.

The details of design are so clearly shown in the engravings that the thing can be readily understood without description.

The Delaware & Hudson have placed an order with the Dickson people for some 14 locomotives. Among them are several moguls for passenger service. Mr. Blackall, superintendent of motive power of this road, claims the distinction of being the first to use this type for passenger train service. No company has been more successful in running mogul engines than the Delaware & Hudson Canal.

The elevated railroads of New York are now so badly crowded with trains that they have to be operated under extremely strict rules from which no deviation can be safely permitted. This is very different from the free and easy practices that prevailed in the early days of the road's history. The men who took a share in the heat and chilling influences of the early days, when rules had not come into vogue and the paymaster's visits were very uncertain, tell about one engineer who was fond of sights, and was in the habit of stopping between stations to witness a fight or any other interesting spectacle, but more particularly a fight. One day as he was approaching a station, he beheld his favorite sight going on on the platform between the gate tender and a man who considered himself entitled to right of way without a ticket. The engineer stopped opposite the fray, and perceiving that his fellow employé was getting the worst of the conflict, he left his engine and threw the intruder down stairs, nearly breaking the man's neck.

Superintendent J. D. Finn, of the Montana division of the Northern Pacific, is enjoying some quiet mirth at the expense of General Agent A. D. Edgar. A short time ago Mr. Edgar concluded to go to Boulder, and started by the company's Boulder branch. As every one who has been over that route knows, when the train reaches the divide it makes the ascent in many loops and curves, presenting beautiful landscapes. After Mr. Edgar admired and commented upon the beauties of nature for about half an hour, he discovered that the train was going very slowly. From his car he could frequently see another railroad track some distance away. "What track is that?" he asked of Superintendent Finn, who was with him. "Why, that is the Montana Central," was the reply and Mr. Edgar concluded, after looking at his timepiece, that he would get off and wait for the other train, which was soon due. "All right," said the obliging official, and the train was brought to a standstill. Mr. Edgar got off and Mr. Finn had all he could do to keep a straight countenance. The train pulled out and made another circuit of the mountain and soon came within view of Mr. Edgar. The latter gentleman signaled the engineer, who stopped and allowed Mr. Edgar to board the train. The general agent began to size the situation up after the train started, and upon seeing the brakeman he was greatly perplexed and said with some surprise, "Why, this is the blank train I just got off of a few minutes ago." And so it was. Matters were evened up when the train reached Boulder.

Testing Red-hot Boilers.

There is a prevalent belief among people, who ought to be better informed, that should a steam boiler get hot through shortness of water, and feed water be suddenly injected upon the hot plates, an explosion is almost certain to follow. The fallacy of this has been repeatedly demonstrated by experiment in the United States, and now we learn that the Manchester Steam Users' Association has instituted a series of tests to ascertain the effect upon an overheated boiler of the entrance of cold water. Three tests were made, the boiler plates in each case being heated nearly to redness. Water was then introduced. In one case the steam pressure rose within a minute from six to 27 pounds, but in the other tests the cold water did not result in increasing the pressure. The effect of the sudden change of temperature was to distort the plates and tubes, but no indications of an explosive tendency were found.

In connection with these tests, some experiments described by Mr. Coleman Sellers at a meeting of the Railway Master Mechanics' Association will be of interest. He said: A locomotive, which was condemned and had been intended to be taken to pieces, was run out on a side track off from Altoona, in the woods, and they determined to try an experiment which they had always desired to see tried, namely, the firing of a boiler until the steam was very high, then blowing it out so as to expose the top of the crown sheet, and allow it to become red hot, and with a large steam fire-engine force water into that engine. They fired it up and retired to a safe distance. They saw the pressure gauge go up to 125 pounds; then the lock-up safety valve blew off, showing it was not weighted heavily enough. They had no means to determine, except by guess, how much to screw it down, and they did it merely by guess, and retired a second time, thinking they could then go on with the experiment as they intended; but they had hardly gone from the boiler—they were not five minutes away from the boiler when the pressure gauge hand seemed to run around as rapidly as anything could be until it reached something near 200 pounds, when the engine blew to atoms. It was full of water, with every condition that would insure safety, except that the pressure was a great deal too great for the strength of the material composing it. No other reason could be given for the explosion.

They then took a second engine and treated it in the same manner, but that one happened to be strong enough to sustain the pressure they desired. They blew the water out, and when the glass gauge indicated that it was below the crown sheet they allowed it to stand long enough for the crown sheet to be red hot and pumped water into it, and in pumping this water in it behaved as I have seen it do in other cases. The steam merely went down. Once or twice or three times they repeated it. The boiler was injured by the fire, but it did not explode it or do any harm to inject large quantities of cold water into the very much over heated boiler.

In other experiments made at the Harrison Boiler Works with cast iron boilers, many gentlemen present, representing a committee of the Franklin Institute, were anxious to see this experiment of a red-hot boiler having water suddenly injected into it tried with a cast iron boiler. They had already fired one of them up to a pressure of 170 pounds. One of these same boilers was fired up to 150 pounds, the blow-off cock was opened, and the whole of the steam discharged. We waited then ten minutes, and heated the furnace so that a stick of wood put against the boiler would immediately become ignited, and we injected the water in. But, instead of making steam, it cooled off the boiler. We waited for steam, blew it off again, and three times we repeated that experiment, and during that whole time I was standing within five feet of that boiler, with my hand on it most of the time, and it behaved just exactly as a mass of iron of that size should have behaved; that is, the water passed into it, merely cooling off the iron and doing nothing else. The experiment was very interesting and very conclusive that the whole mass of the boiler, if heated red hot, does not contain heat enough to raise the water the boiler will hold up to the steam point.

Gas Fuel Fallacies.

The use of natural gas in a few cities of the Union and the great convenience and cleanliness of this kind of fuel has led many people to believe that gas will be the fuel of the future. This puts them open to the conviction that a gain can be made by converting all kinds of fuel into gas before using it and they readily became converts to an erroneous belief. There may be convenience and certain advantages in converting solid and liquid fuel into gas before using it, but there is sure to be a reduction of heat energy, for no manipulation overcomes nature's absolute law that the conversion of any substance from one form to another can only be effected by the expenditure of energy. When coal or oil is converted into gas a great amount of work must be done in forcing the atoms into a new form and the potential power as fuel of the resulting gas is short, at least the amount of energy expended in making the change. Yet it is not uncommon for advocates of gaseous fuel to be found asserting that gas made from a certain weight of coal contains more heat units than the coal originally possessed. It is a good plan to apply the rule of common sense in the examination of such claims. In a paper read before the Institute of Mining Engineers sometime ago Mr. W. J. Taylor exploded a variety of fallacies regarding fuel manipulation.

The extravagant claims, he said, of some oil gas advocates is still frequently heard, that by vaporizing oil with steam, and then passing the mixture through a coil of hot iron pipe, an oil-water-gas containing 26,600 heat-units is formed from one pound of oil carrying originally 21,000 heat-units, while the only energy expended on the gas has been by the introduction of a little steam and a little extraneous heat. Theoretically, one pound of oil converted into water-gas carries 26,600 heat-units, but this is only obtainable by a large expenditure of energy, the amount of which is difficult to calculate; even with apparatus of theoretically perfect efficiency, it could not be less than the quantity of heat added to the calorific energy of the oil.

Again we hear that natural gas has been entirely superseded by a wonderful process of simply superheating steam in iron pipes and getting pure hydrogen at the exit, oxygen being absorbed or carried off by some unknown and extraordinary means. And within the past year we have had reports of a marvelous grate, burning coal backward, and drawing down the chimney, that carries off the products of combustion, a wonderful "consuming element," which would evaporate 20 pounds of water with 1 pound of coal, thus rivaling or surpassing even a famous system of using energy over and over, by which 18 to 20 pounds of water could be evaporated to steam per pound of coal burned. These and kindred impossible schemes are constantly thrust on the investing public, often with success, and in some cases without intention of fraud, but through the ignorance of the promoters themselves.

The cheapest artificial fuel-gas per unit of heat is common producer-gas, or "air-gas" as it might be termed, since the oxygen for turning carbon to carbon monoxide is derived mainly from air. The associated atmospheric nitrogen dilutes the carbon monoxide, making air-gas the weakest of all useful gases—that is, the lowest in combustion, both by weight and by volume. Next in the order of heat energy comes water-gas, in which the oxygen for combining with carbon to form carbon monoxide is derived from water-vapor, and hydrogen is liberated. For equal volumes this gas has more than double the calorific power of air-gas. Third in the ascending scale stands coal-gas, the ordinary illuminating gas distilled from bituminous coal, which carries more than double the heat energy of water gas. Last and highest in the list comes the gas made in nature's producer, which we cannot duplicate in practice by any known process. The caloritic power of natural gas is about 50 per cent. greater than that of coal-gas.

The Use, Care and Abuse of Emery Wheels.

BY B. RICH.

The emery wheel is an improved grindstone; it is gradually pushing the filthy, sloppy grindstone out of the shop in well ordered establishments, but it is not making as rapid progress into favor in railroad shops as its merits demand. The emery wheel is one of our native American products. It was brought into popularity by our most enterprising mechanics, and those who take a pride in producing work on a sound business basis are certain to extend the use of the emery wheel where it can be used to advantage. It has its proper place in a shop, and when it is used for doing work that it is not adapted for, the emery wheel is not a success any more than any other tool is, or any workman is when out of place.

Because it has been frequently tried on work that it was not fitted for is, no doubt, the reason why the emery wheel has been called a failure in shops where it ought to be of the greatest possible service. The foremen of many railroad shops appear to believe that the proper work for emery wheels is polishing and finishing. Its rapidity in performing the tedious operations formerly done by the slow process of draw-filing and emery finishing by hand appeals to the most conservative foreman; but he very often decides to stop there, and for other parts of his work lets well enough alone.

When he has got to finishing and polishing, he has just begun at the end of the line of the emery wheel's capacity for usefulness, and the department where its money saving capability, in a railroad shop, is the most limited. The emery wheel ought to be used to take a great deal of the work now done on planers, milling machines and lathes. If properly handled it will effect great saving in the cost of doing work on the machines mentioned, and do it better. Not, however, all kinds of work, but the work for which it is adapted and which must be selected by the exercise of good judgment. As a substitute for the cold chisel and file, the emery wheel is in its most buoyant and comprehensive element. Those who neglect this line of work for the emery wheel put men pigmies to doing tedious labor that the giant emery can tear apart quickly by handfuls and not feel the work.

In some shops, however, this is the only work kept for the emery wheel, and the mistake is nearly always made of putting the stupidest and least skillful man in the shop to feed giant emery, and under such handling this beneficent sprite becomes a filthy, awkward sluggard.

The axiom that good tools and good men are worth looking after, which is making headway in workshop philosophy, appears to be generally neglected in the case of emery wheels and the care taken of them. Who ever hears of a foreman making any question about the quality of emery wheels, except to indicate the coarseness of grain? Yet it is apparent to everbody that some emery wheels do their work rapidly and always have a cutting edge, while others are continually in a condition of slippery gumminess. A foreman ought to find out the kind of emery wheels that do their work best, and distinguish them in making requisitions.

Then the fact has not come home to many people who use emery wheels that they need any care when not in use. Emery is a silicate of aluminum, and has a tendency to absorb moisture, which has a prejudicial effect upon the wheel. This is not much recognized in shop practice, for no floor or wall appears to be too damp to prevent impact with emery wheels that are off the arbor. A maker of emery wheels tells a story of a country mechanic who went to town for an emery wheel, and drove for two hours with the wheel in his wagon exposed to a pouring rain. Finding that the material had become soft, the man put the wheel to bake in his house oven all night, and was killed by the wheel breaking in the morning when he put it to work. Nemesis does not often hit the proper representative of stupidity in the machine shop with a chunk of emery. Unfortunately the wrong fellow generally gets hurt, or there might be rejoicing in the paradise of good sense when an emery wheel burst and sent another victim to the endless home of folly.

An emery wheel that is softened in spots by moisture is liable to warp out of true in drying, and if it be put to work before being perfectly dry, the wear will be uneven. Then it will work badly, and ten to one but the foreman swears that a defective wheel has been supplied.

A writer in your paper some time ago hits the nail on the head about the care of emery wheels when he says:

If a solid but porous wheel is subjected to dampness, or to unequal action of air and dampness, it may become injured. It certainly is injured by having the corners chipped off by lying about under a bench with old junk, and it should get more sensible treatment.

A good plan for keeping all emery wheels would be to lay them in a box or drawer, in dry sand or sawdust, keeping them with as much care as one would an edged tool or a razor. Too much care will do no harm.

If, upon receiving an emery wheel from the maker the user would tap it lightly with a hammer, he will find it has a note or sound. Now, if, when he uses the wheel after an interval of repose he would again tap it lightly with his hammer in the same way, he will notice readily any change of sound or ring. If the wheel, on being tapped, sounds dead, or if it is cracked, he will readily notice the change in sound. This change is the only intelligence any solid wheel possesses; the man who uses it must govern himself accordingly.

Mahogany.

Various kinds of fancy woods have at different times obtained popularity in decorating the inside of cars, but no variety wears so well as mahogany, which is now the favorite for all cars with any pretension to high artistic finish. The prevailing popularity of this wood makes of an interest the following historical sketch contributed to this journal in 1873:

The mahogany tree was discovered just a little before the year 1600, and not till nearly a century later was it brought into European use. The first mention of it is that it was used in the repair of some of Sir Walter Raleigh's ships, at Trinidad, in 1597. Its finely variegated tints were admired; but in that age the dream of El Dorado caused matters of more value to be neglected. The first that was brought to England was about the beginning of the last century, a few planks having been sent to Dr. Gibbons, of London, by a brother who was a West Indian captain. The doctor was erecting a house, and gave the planks to the workmen, who rejected them as being too hard. The doctor then had a candle box made of the wood, his cabinet maker also complaining of the hardness of the timber. But, when finished, the box became an object of general curiosity and admiration. He had one bureau, and Her Grace of Buckingham had another, made of this beautiful wood; and the despised mahogany now became a prominent article of luxury, and at the same time raised the fortunes of the cabinet-maker (Wollaston) by whom it had been at first so little regarded. Since that time, rivaling and almost displacing all other ornamental woods, mahogany has become everywhere indispensable, and is, all over the world converted into whatever of useful or beautiful may promote the convenience and comfort, or delight the taste, the caprice, or the religious sentiment, of civilized man.

The mahogany tree is found in Florida, and may thus be claimed as indigenous to the United States; and there is no reason to doubt that it may and hereafter will be planted and cultivated to great advantage. But hitherto it has been cut chiefly in the native forests of the Bahamas, the West India Islands, Honduras, and Yucatan.

Full grown it is one of the monarchs of the forests of tropical America. Its vast trunk and massive arms, rising to a very lofty height, and spreading with graceful sweep over immense spaces—covered with beautiful foliage, bright, glossy, light and airy, clinging so long to the spray as to make it almost an evergreen—present a rare combination of loveliness and grandeur. The leaves are very small, delicate, and polished like those of the laurel. The flowers are small and white, or greenish yellow. The fruit is a hard, woody capsule, oval, not unlike the egg of a turkey in size and shape, and contains five cells, in each of which are inclosed about 15 seeds.

A few facts will furnish a tolerably distinct idea of the size of this splendid tree. The mahogany lumbermen,

having selected a tree, surround it with a platform about 12 feet above the ground, and cut it above the platform. Some dozen or 15 feet of the largest part of the trunk are thus lost. Yet a single log not unfrequently weighs from 6 or 7 to 15 tons, and sometimes measures as much as 17 feet in length and 4½ to 5½ feet in diameter, one tree furnishing two, three or four such logs. Some trees have yielded 12,000 superficial feet, and at average piece prices have sold for $15,000. Messrs. Broadwood, London, pianoforte manufacturers, paid £3,000 for three logs, all cut from one tree, and each about 15 feet long and more than three feet square.

In low and damp soils its growth is rapid; but the most valuable trees grow slowly among rocks on sterile soil, and seem to gather compactness and beauty from the very struggle which they make for an existence. In the Bahamas, in the most desolate regions, once flourished that curiously veined and much esteemed variety once known in Europe as "Madeira wood," but which has long since been exterminated. Jamaica, also, which used to be a fruitful source of mahogany, and whence in 1753 not less than 521,000 feet were shipped, is now almost depleted. That which is now furnished from there is very inferior, pale, and porous, and is less esteemed than that of Cuba, San Domingo, or Honduras.

Changing Swing Motion Trucks to Rigid Centers.

The cost of maintaining swing motion trucks over rigid trucks is considerable. A prominent Superintendent of Motive Power states he once built several hundred swing motion trucks and watched them closely for two years. In that time he found the swing truck cost 30 per cent. more than the rigid truck to maintain, and cost per pair $35 more to build. The advocates of swing trucks assert that the swing or movement allowable should not exceed from ½ inch to ⅝ inch each way from the center. As the average rigid truck after a little service will have this much lateral or side play, it appears that the swing advocates put in a swing motion which can't swing practically more than the rigid truck. Why then go to the expense of the swing motion?

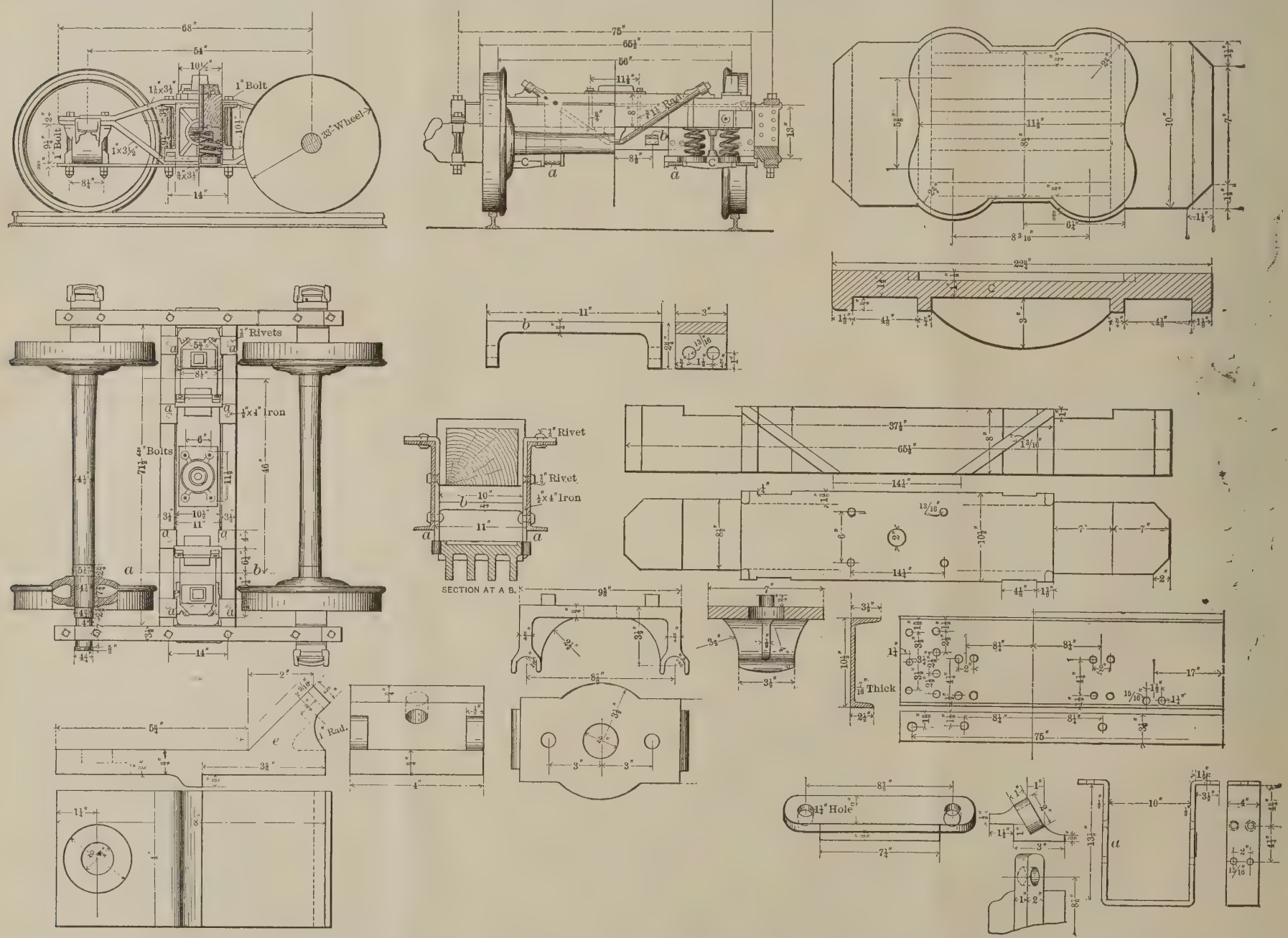
The cost of the channel bar swing motion truck, per pair or per car, more than the ordinary rigid truck, with oak bolsters and spring planks, is $28.40 for material alone, made up of four channel bars at $3.85 each; 240 lbs. forgings at 4c. and 170 lbs. castings at 2c. The extra labor per pair of trucks is estimated at $5, making a total of $33.40 per car more for swing channel bar trucks than for rigid trucks. The Santa Fe propose in overhauling their cars to put in the rigid feature shown in the engravings, as designed by Mr. Player, and it appears that it can be made at no cost to the Company. That is, there will be $13 worth of castings and forgings per pair of trucks dispensed with, which will be used to maintain unchanged cars, and which would have to be made at the shops otherwise, and $13 more than covers the cost of the material necessary to make a rigid truck.

Four hangers, *a a*, rigidly riveted to the channels, sustain a casting, *c*, on which rest the springs. Two braces, *b*, per truck, riveted between the channel, has to prevent their spreading, which they do to a dangerous extent without this brace, which also acts as a safety stop in case the springs or hangers break. Chafing plates, *e*, clip against the outer hangers.

By means of a special punch the necessary holes in the channel bars are rapidly punched in place by means of a sledge hammer.

The writer was once connected with a road on which mysterious derailments often occurred. The road was full of short, sharp curves, and the speed of freight trains high.

These derailments disappeared after the substitution of rigid trucks. The former swing trucks allowed of a three-inch swing of the bolster each way from the center or normal position. It will readily be seen that a rigid truck in being deflected from a tangent to a curve, has its flanges *pressed* to the outer rail with a *pressure* due to the load of the car and its speed. A swing motion truck has its flanges brought to the rail under the same conditions with a blow, that is, the weight of the car tending to keep a straight line moves laterally through whatever distance the swing motion allows of—often three inches, and necessarily the weight of the car is augmented by the distance it moves through laterally, bringing the flanges with a sudden blow to the rail, and with high speed and sharp flanges the conditions are about right for the wheel to mount the rail. The flanges of a rigid truck assume more of the character of a static force when leaning against the rail on a curve, while a swing motion converts it into a dynamic force. A man may *press* a sledge hammer to an anvil with a pressure due alone to his weight, while if he raise the hammer and swing it through space the force with which it meets the anvil is many times the man's weight. The one is static, the other dynamic force, and the conditions of rigid and swing trucks similar. A very serious accident lately occurred in the derailment of an engine tender as it struck a curve at very high speed. The tender on striking the curve, raised its outer side to an angle of nearly 45 degrees. Examination showed the tender had left the track at the beginning of the curve going over the outer rail. Nothing broken could be found. The swing bolster could swing three inches from the center line and the rails showed where the wheels had mounted it.



The Chicago & Northwestern are receiving from the Schenectady Locomotive Works 20 ten-wheel locomotives that are suitable for either heavy fast passenger or fast freight service. The cylinders are 19 × 25 inches, and the wheel centers are 57 inches. The boilers are of the wagon-top type, 58 inches diameter at the smallest ring, and made of half-inch steel. The firebox is 95 inches long by 40 inches, and set above the frames, which have a depression to increase the depth of the firebox in front. The flues are 12½ feet long. The total heating surface is 1,545 square feet. They are also getting from the same works 10 six-wheel switchers with cylinders 17 × 24 inches and 44-inch wheel centers.

"Look here, young man," said the lately resigned conductor to the railroad editor, "I've always treated you white, haven't I?"

"You have."

"And when I resigned the other day didn't I tell you I worked for the company 20 years?"

"I believe so."

"And yet this is the kind of send-off you give me." And he laid the last issue of the paper on the table and pointed to the notice of his retirement, which stated that he "had worked the company for 20 years."—*St. Joseph News.*

On European railways all freight trains and not a few passenger trains are controlled by means of hand brakes placed on the tender of the engine and on brake vans. The power is invariably applied by means of a screw cut upon the end of the brake staff, working in a nut connected with the levers that apply the shoes. These screws are very unsatisfactory, wear out rapidly and require constant care; nevertheless we have repeatedly seen the use of screws advocated for our hand brakes as an improvement on the chain and pawl. It may interest people who advocate this change to know that experiments made in France lately to test the efficiency of the screw showed that only 20 per cent. of the power applied to the hand wheel was transmitted to the brake shoes.

The Billmeyer & Small Co., carbuilders of York, Pa., have an unusual large stock of well-seasoned lumber on hand. A visit to their works disclosed the fact that they had upward of one million feet of oak for cross beams or trucks, two years old and weather seasoned; one and a half million feet yellow pine stringers from two to eight years old; one million feet of oak and pine lumber for flooring and siding, and an immense quantity of hardwoods under cover, consisting of quartered oak, redwood, ash, poplar, etc., none less than a year old.

Double-Cylinder Planer and Smoother.

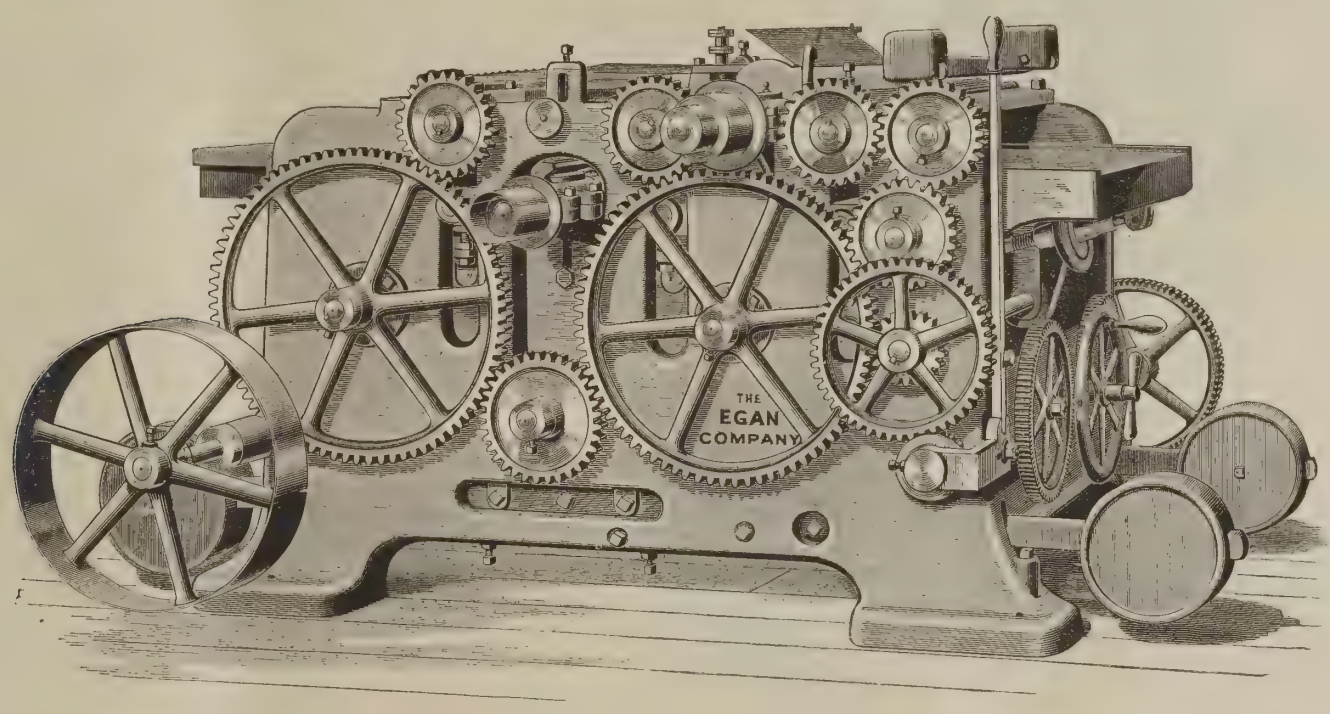
The essential machine in all wood-working outfits is the planer, and any improvements for better and more work always interests the mechanic. We display on this page a cut of something entirely new in many particulars. The firm mentioned below have long been known as being abreast of these progressive times and as introducers of strictly time and labor-saving tools to reduce cost of manufacture down to the lowest point.

Close competition in making up all kinds of wood work has created a demand for a first-class double-cylinder planer and smoother, a machine that will plane as smooth with the under cylinder as it will with the upper cylinder, and yet simple to adjust and to operate. This No. 9 is constructed on an entirely new principle, the main bed being raised and lowered on inclines, combining strength and solidity, two great factors which tend to make a perfect smoother.

The frame is cored out and substantially braced, all necessary parts planed perfectly true, and when bolted together makes a suitable frame for a machine of this class, and one that can be relied upon for doing perfect work.

The main bed is fitted to planed ways in the frame and raised and lowered on inclines by means of two screws, operated by a center pinion and hand wheel convenient to the operator. An extra adjustment is also provided for raising and lowering the receiving plate of the lower cylinder, so as to change the amount of cut while the stock is being fed through. All adjustments are made from the working end of the machine.

The feed consists of six very powerfully geared feed-rolls, of large diameter, and the fluted or front feed-roll is driven



by expansion gearing, making it impossible for the roll to lift out of gear when taking a heavy cut. The feed-rolls are weighted on an entirely new principle, the weights being adjustable to give more or less weight as desired. There are two feeds to the machine, and the feed is controlled by the speed of the main cylinder, so that if the main cylinder slacks up, the feed does in proportion. The last pair of feed-rolls are placed outside the lower cylinder and arranged in this way: each piece put through the machine is fed entirely through, independent of another piece following it up,

The cylinders are of solid steel and made four sided, so that two or four knives may be used on the cylinder as desired. The upper cylinder is belted from both sides of the machine.

Suitable arrangements are made to disconnect the lower cylinder and entire boxing, which can be taken out instantly when desired. The pressure-bars are made on an entirely new principle, working on the circle of the head, holding the stock down to the bed and close to the knife, thereby preventing all tearing out and clipping of ends of boards and insuring first-class, smooth work, on either hard or soft wood, either straight or cross-grained.

One of the greatest advantages of this machine, especially in the wider sizes, is that the stock can be passed diagonally under the cylinder, which is far better than running a cylinder in a diagonal position, as it permits straight belts being run to the cylinder and the perfect balancing of same. It is especially adapted to planing framed stock, when straight and cross-grained stock is built up, and which has given car builders a great deal of trouble, and we believe has never been accomplished heretofore, especially on a double-cylinder machine. That it will do this class of work perfectly is sufficient to recommend it.

Car builders who have stock to dress on one or both sides and who have wide, hardwood tops or other glued-up work to plane, and who have not found a machine to do the work to their satisfaction, will be more than pleased with the work done on this machine, and will be astonished at the speed at which it will do it. For car builders, railroad shops and planing mills it will be found a valuable acquisition and for piano and organ work, which must necessarily be perfectly smooth, it will excel any other machine, as no better machine can be found to prepare work for a sander, while its great capacity fits it for general planing.

For prices on this, or for information in regard to any other machinery in the wood-working line, address the Eagan Company, Cincinnati, Ohio.

The address of the Baker Heater Company has been changed to 779 Greenwich Street, New York.

The Newark Machine Tool Company report a growing demand for their horizontal boring and drilling machines. All who use these machines testify favorably about their convenience.

The McConway & Torley Co., Pittsburgh, announce to railroad companies that they will enter into contracts covering a term of five years to maintain Janney couplers for freight cars at the fixed rate of $1 a year. They will give the insured the right to withdraw from the contract at the expiration of one year.

Mr. J. T. Woodward, who has charge of the Canadian Agency and manufacturing of the Consolidated Car-Heating Company at Coaticook, P. Q., has become interested in the Norton Improved Compound Jack and has resigned his position with the Consolidated Company. The Consolidated Company and all Mr. Woodward's friends join in wishing him greatest success in his new enterprise. The Consolidated Car-Heating Company Agency and manufacturing in Canada has been placed under the direction of Messrs. Sleeper & Akhurst, of Coaticook, who have an extensive business and are large makers of machinery. They will give special attention to the manufacturing of the Consolidated Company devices for Canadian roads.

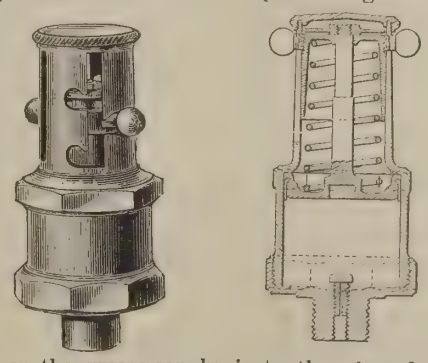
The business of the Diamond Machine Company, of Providence, R. I., at the close of the year shows a large increase over any previous year in their existence. Constant additions of machinery and tools have been made to their plant (which latter has also been extended in the year 1890) in order to enable them to keep up with their demands.

Their orders show no falling off in extent. They cover all points of this country and abroad.

Renewed efforts and further additions are to be made in 1891 to increase their production and sales.

The Lackawanna Locomotive Grease Cup.

The grease cup shown below is specially adapted for use on crank-pins, guides, eccentrics and other locomotive bearings. The leading points made for the cup are that it provides a position for a feed with perfect regulation. The



pressure on the grease can be instantly released by hand without the use of wrenches or screws, and the engineer can see at a glance whether the feed is on or off. Those who have used this cup commend it very highly as a means of saving lubricants, and of securing a regular supply to rubbing surfaces. It is made by the Lackawanna Lubricating Company, Scranton, Pa.

The Canadian Pacific Railway and the "Soo Line" have lately awarded, as we have already noted, considerable contracts for car heating to the Consolidated Car Heating Company. The McElroy-Commingler and Sewall coupler are specified, and equipping is already going on at Minneapolis and Montreal. These roads have in all some 600 passenger cars and 300 passenger locomotives. The year of 1891 opens well for the Consolidated Car Heating Company which has also good orders lately received from the Boston & Maine, the Old Colony, the Fitchburg and the Grand Trunk Railroads.

Mr. E. A. Smith, assistant secretary, Albany, N. Y., has been appointed purchasing agent for the Consolidated Car Heating Company.

H. A. Wheeler & Co., Chicago, have closed a contract with the Missouri, Kansas & Texas to equip seventeen new coaches with the Johnson Car Seat.

The Consolidated Car-Heating Company has entered suit against the Martin Anti-Fire Car Heater Company for infringement of patents covering piping in cars and has asked for an injunction to prevent future use and that damages may be awarded for past infringement.

The Wood vulcanizing process seems to be rapidly commanding the notice which it so fairly deserves, if but a modicum of the claims made in its behalf are susceptible of actual demonstration.

Wonderful results in beautifying as well as curing all finishing lumber are shown, and in addition to its preservative qualities the merit claimed for it, of exceptional cheapness, should enlist the attention of the carbuilders' trade particularly.

One of the most popular appliances introduced upon freight cars is the Butler drawbar attachment. A significant thing connected with this attachment is that those who once use it soon call for more. It has lately been specified for to be put on the 5,250 cars ordered by the Philadelphia & Reading, and it is generally put on cars contracted for or built by the Lehigh Valley Railroad. The East Tennessee Virginia & Georgia Company use it on all their lines and many other companies are adopting it because it is found to be a great saving in the expense of car repairs.

Among the changes for the new year we note that of the energetic and reliable railway supply house of Boaz & Maxwell, of Cincinnati, which is succeeded by C. H. Boaz & Co.

They have a large and growing business, and handle many leading specialties, of railway consumption, among them the Lukens high quality boiler and fire box steel plate; also Turton's fine crucible spring steel for which there is a steady and increasing demand, some extraordinary results as to wear and durability being reported, especially of locomotive driving and truck springs.

We understand that Mr. J. H. Holway, formerly a railroad purchasing agent of large experience, will continue with the new firm.

The Magnolia Metal Company has received the following letter from the managing director of the Trenton Iron Company: "We are pleased to be able to state that we have been using your magnolia metal for some time on the crank pin bearings and also on the cross heads of our large Corliss engine with the most satisfactory results. This engine is about 300 horse power, and is run at an excessively high rate of speed, and consequently it has been very difficult heretofore to keep any metal in these bearings which did not wear out very fast and cause great trouble by heat. Since we have put your metal in we have had no trouble whatever, and from the results we have obtained on this engine we have determined in future to use your metal exclusively on all of our work."

The Springfield Emery Wheel Manufacturing Company, of Bridgeport, Conn., who a short time ago found themselves in financial embarrassment, and under the necessity of calling a meeting of their creditors, have been granted the extension of time asked for in which to pay their debts. This guarantees the continuance of the business. The management will be changed somewhat, although the invaluable services of the founders of the business will be retained. The works have not lost any during the trouble, but owing to circumstances only about a two-third force was employed. The works will now be pushed to their fullest capacity, and with the large line manufactured and a good supply of orders on hand the outlook is very promising.

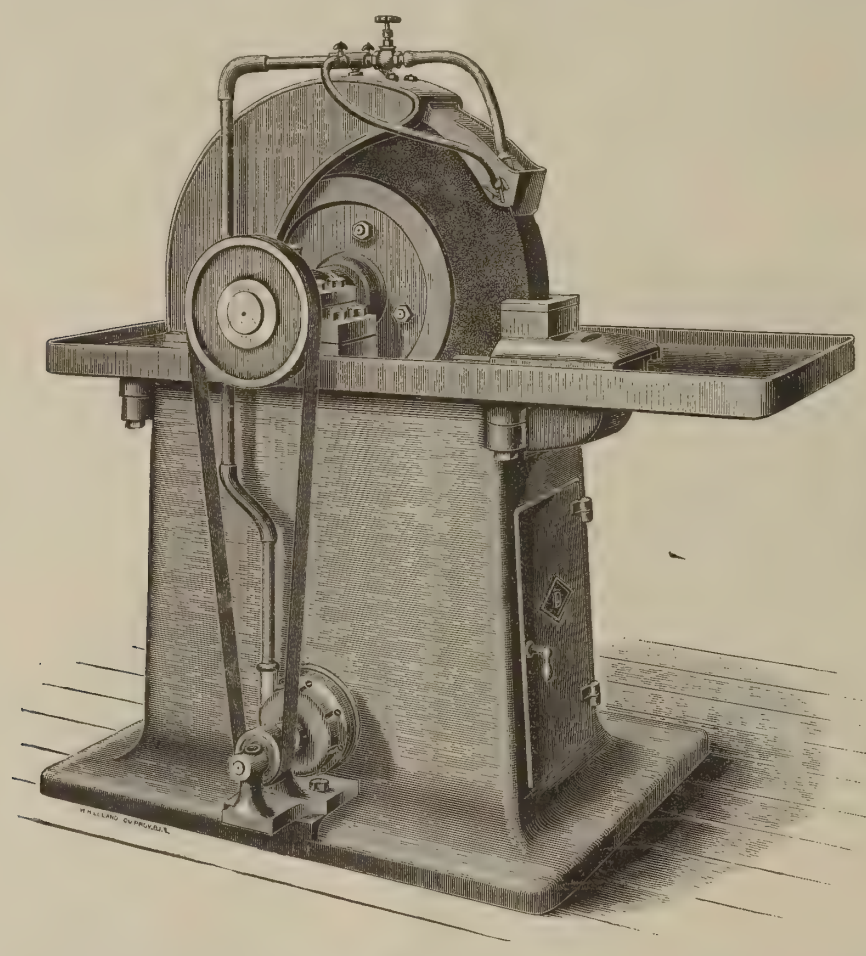
Single Wheel Tool Grinder.

The accompanying illustration shows the Diamond Machine Company's single wheel tool grinder, No. 4, using emery wheel, 30 × 4 inches, with 16-inch hole, using their improved flanges.

Dimensions of this machine are: Size of base, 28 × 45 inches; height from floor to center of spindle, 37 inches; length of bearing, 8 inches; diameter of spindle in bearings, ¾ inches; diameter of spindle between flanges, 3 inches; size of pulley on spindle, 14 × 6 inches; weight of this machine, 1,800 pounds.

Machine has tanks inside of column easily accessible, and an arrangement for drawing the water by a siphon from the upper to the lower tank; babbitt boxes, protected at each end by a patented dust excluding device, has improved centrifugal pump. Water is distributed directly in front of the tool when being ground. Hood inside has a raised surface cast, which is the outside diameter of the flanges used, which leads all spray or water from the inside of the hood to the column, keeping it entirely from the spindle and boxes.

The rests are movable to and from the wheel without the use of a wrench. Table and tool rest are so arranged that water used on the wheel is entirely confined to the machine, this being a decided advantage over machines of this class.



Collars, spindles of steel, pulleys and all running parts are turned inside and out, to obtain a well balanced smooth running machine. Countershaft for this machine has tight and loose pulleys 10 inches diameter 6-inch face, driving pulley is 18 inches diameter 6-inch face, drop of hangers is 12 inches, entire length of countershaft is 40 inches. Should run 260 to 280 revolutions per minute, which would give the emery wheel a speed per minute of 300 to 330 revolutions.

This company manufactures these machines in four sizes, running wheels 18 × 2½ inches, 24 × 3 inches, 30 × 4 inches and 36 × 4 inches diameter, same general description as above applying to each.

An Automatic Brake Rod Adjuster.

The Consolidated Brake Adjuster Co. has recently perfected a device for automatically adjusting the slack in brake gears, occasioned by the wearing away of the shoes. The mechanism is attached to the lower end of the live or floating lever of the truck, and by a ratchet-like motion shortens the lower brake rod as the brakes are applied and released. It may be described briefly as follows: The end of the brake rod instead of having a jaw for connecting with the lower end of the lever has a wing about ⅝ × ⅝ in in section forged on each side of it for a length of about nine inches. This is inserted in a malleable casting of box-like shape, which is attached to the lowsr end of the lever by the usual pin. It contains a series of washers about $\frac{3}{16}$-in. thick, which are about square in shape, and each one of these has an irregular hole stamped in it of such a shape that while in the normal position it rests upon the wings of the brake rod and the latter can slip through it. It can drop about one-half inch when over a part of the brake rod which is circular in section, and when in this second position the winged portion of the brake rod cannot be drawn through them. The further the brake rod is drawn into the casting the greater the number of washers which will drop in front of the two wings, and they prevent the return of the rod, thereby virtually shortening the length of the connection between the two truck levers by an amount equal in thickness to all the washers which have dropped into the second position. To draw this rod through the malleable casting as the brake shoes wear, a small dog is attached to it which contains a cam so fitted that the dog can slide along the rod in one direction, but takes a firm hold of it if an attempt is made to move it in the other. This dog is operated by a small connecting rod which takes hold of the brake beam lever at a point about three inches from the lower end. The movement of the lever in applying the brakes has the effect of pulling this brake rod through the malleable casting with a rachet-like motion, and the washers drop one by one in front of the wings before mentioned as the shoes wear. A very simple movement restores the rod to its normal length when new brake shoes are applied.

The mechanism is quite simple and reliable. Experiments have been in progress for a year past, which have demonstrated its success, and quite a number of roads will soon equip a train each in order that they may also demonstrate its value. In our next issue we will present drawings of this device and a better explanation of the details will be given.

Mushet's Special Steel.

This steel so deservedly popular among those who perform work on metals that is severe on tools, was introduced into the United States about twenty years ago and quickly gained favor among machinists. It is particularly noted for hardness, endurance and uniformity, characteristics that have never been successfully imitated although attempts to that end have been very persistently carried on. With tools made from this steel machinists are enabled to run their machines at a greatly increased rate of speed, and thereby turn off a very much larger amount of work in a given time than it would be possible to do with any other known steel.

The steel is made by a secret process, which produces the peculiar hard and uniform characteristics of the material. The results obtained appear to be due to manipulation alone, for the most careful chemical analyses fail to indicate wherein the mushet steel differs from many other brands of good tool steel. The steel certainly holds a very unique position among metals in respect to its constructive properties, and its well known economic advantages. We must confess that the former interests us most and in this connection, we recall to mind the recent words of a scientist to the writer: "We may analyze the forces of nature and to some extent harness them to our use, but could we combine them, we should be gods and not men."

This want of combination is the principle that has prevented any really successful imitation of the "Mushet's" steel; the want of combination in which the elements have especial reference to order, place and adaptability, without which the material becomes, comparatively speaking, a mere agglomeration. This idea is proved and forced upon us by the fact that many honest efforts have been made to make steel like the "Mushet's," the results of which have been that while self-hardening has been attained the displacement of elements has been such as to greatly impair its effective service, and just at this point all imitators of "Mushet" are at sea!

Messrs. Byram & Co., within the first full week of January, this year, shipped eight Colliau cupola furnaces, having a daily melting capacity of 232 tons. Included in the above was shipped the sixth Colliau furnace which Byram & Co. have supplied to one manufacturing concern located in Pennsylvania.

We are informed that the Barney & Smith Manufacturing Company have ordered 1,250 of the Pullman sash balances. The Lehigh Valley Railroad Company have also ordered a large number of these sashes.

We are informed that the Railway Lighting and Heating Company having been dissolved, the Railroad Lighting and Manufacturing Company has become purchasers of its business, assets and contracts, and has assumed all the liabilities of the Railway Lighting and Heating Company.

Our Directory.

We note the following changes during last month:

Baltimore & Ohio.—R. M. Sheats has been appointed superintendent of the Western Division, main stem, in place of J. F. Legge.

Baltimore & Potomac.—J. B. Hutchinson, previously superintendent of the Western Pennsylvania Division Pennsylvania Railroad, has been appointed superintendent in place of H. H. Carter, resigned.

Charleston, Cincinnati & Chicago.—John F. Jones, previously superintendent, has been appointed general manager, with office at Blacksburg, S. C.

Chicago, Burlington & Quincy.—J. F. Deems has been appointed master mechanic of the Middle Iowa Division, vice E. Jones, transferred to be master mechanic of the West Iowa Division, succeeding P. Wallis, resigned.

Chicago, Fort Madison & Des Moines.—E. F. Potter has been appointed superintendent, with headquarters at Fort Madison, Ia., in place of Wm. P. Scott, resigned.

Cincinnati, Hamilton & Dayton.—Alexander Galloway has been appointed superintendent of the Cincinnati, Hamilton & Indianapolis Division of this railroad. Superintendent Husted of that division has been transferred to the Dayton & Michigan Division, vice M. Mounts, who resigned to accept the general superintendency of the Pacific & Pekin Union.

Cincinnati, New Orleans & Texas Pacific.—A. Griggs has been appointed superintendent of this road, with office at Somerset, Ky., vice H. F. Clark, assigned to other duties.

Cleveland, Lorain & Wheeling.—Edwin R. Perkins has been elected president, succeeding Selah Chamberlain, deceased.

Delaware, Lackawanna & Western.—David Brown has been appointed general master mechanic of this road, vice Charles Graham, resigned.

Des Moines & Fort Dodge.—J. McGrayel, master mechanic, has resigned.

Des Moines & Northwestern.—Geo. W. Ogilvie, superintendent and purchasing agent, has resigned from that position, and F. C. Hubbell will perform the duties connected with that office.

Evansville & Terre Haute.—W. M. Corbett has been appointed superintendent.

Grand Trunk.—Joseph Hickson has resigned the position of general manager of the Grand Trunk Railway. He will be succeeded by L. J. Sergeant, general traffic manager.

Gulf, Colorado & Santa Fe.—S. S. Morris, division superintendent, has resigned.

Jacksonville, Tampa & Key West.—W. B. Coffin has been appointed superintendent, with office at Jacksonville, Fla.

Kansas City, Fort Scott & Memphis.—W. W. Fagan, superintendent, has resigned, to become general superintendent of the St. Louis, Iron Mountain & Southern and Little Rock & Fort Smith roads. He will be succeeded by J. H. Sullivan.

Louisville, New Albany & Chicago,—John O. Ewan, recently appointed superintendent of the second division, has resigned.

Louisville, St. Louis & Texas.—J. C. Loomis, formerly superintendent of the Second Division of the Louisville, New Albany & Chicago, and also superintendent of the Louisville & Nashville, has been made general superintendent of this road, with headquarters at Louisville.

Minneapolis & St. Louis.—W. H. Whitaker has been appointed M. M.

Nevada Central.—Mr. W. J. Hilands has been appointed purchasing agent.

New York Central.—John D. Campbell has been appointed assistant superintendent of motive power.

New York, Lake Erie & Western.—J. H. Barrett has been appointed superintendent of the Erie division.

New York & New England.—R. B. Williams has been appointed superintendent of the Western & Springfield division.

New York, New Haven & Hartford.—R. C. Curtiss has been appointed superintendent of the Northampton division, with office at New Haven, Conn.

New York, Pennsylvania & Ohio.—J. C. Moorehead has been appointed superintendent.

Northern Pacific.—W. H. Bancroft appointed superintendent Rocky Mountain division.

Oregonian.—Superintendent Charles N. Scott retired from the duties of that position Jan. 1, the road having passed into the management of the Southern Pacific system, and operated by the management of that company's lines in Oregon.

Pennsylvania.—J. B. Hutchinson, superintendent of the Western Pennsylvania division, with headquarters at Allegheny City, Pa., has been appointed superintendent of the Maryland division of the Philadelphia, Wilmington and Baltimore Railroad, vice H. H. Carter, who resigned, to retire from the railroad business. James Reed, superintendent of the Schuylkill division, with headquarters at Reading, Pa., will be superintendent of the West Pennsylvania division, with headquarters at Allegheny City. W. Hayward Myers, superintendent of the Belvidere division, will succeed Mr. Reed at Reading. Wilson Brown, superintendent of the Frederick Division, will go to the Belvidere division as superintendent, and G. W. Creighton, at present assistant engineer of the Philadelphia division, will become superintendent of the Frederick division.

L. K. Lodge, Superintendent of the Altoona division, died Dec. 31 of typhoid pneumonia at his home in Altoona.

Peoria & Pekin Union.—M. Mounts has been appointed general superintendent, with headquarters at Peoria, Ill., in place of Mr. M. S. Connors, resigned.

Philadelphia & Reading.—G. F. H. von Wrede has been appointed master mechanic of the main line division, with headquarters at Philadelphia.

Rio Grande Western.—J. B. Dailey has been appointed master mechanic, with headquarters at Salt Lake City, vice S. C. Smith, resigned.

St. Paul & Duluth.—Geo. D. Brooke has been appointed master mechanic.

South Atlantic & Ohio.—D. H. Conklin has been appointed general superintendent of this company, succeeding H. W. Bates, resigned. The office of general manager, which he held, has been abolished. The office of general superintendent is at Bristol, Tenn.

Southern Pacific.—Superintendent James Deitrick, of the Visalia, Goshen, Fresno and Yosemite divisions, has resigned.

Union Pacific.—General manager Meek, of the Denver & Fort Worth division, has resigned. Joseph H. McConnell, master mechanic of the Union Pacific at North Platte, Neb., has been appointed to succeed Harvey Middleton as superintendent of motive power and machinery, with headquarters at Omaha.

Western & Atlantic.—Wm. Kinyon, M. C. B., has resigned.

NATIONAL CAR AND LOCOMOTIVE BUILDER

MARCH, 1891.

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The Chicago, Burlington & Quincy are preparing to build a steel bridge across the Mississippi River at Alton.

The Chesapeake & Ohio intend having ten or fifteen freight and switching locomotives built soon and 500 freight cars.

The Railroad Commissioners of New Hampshire say that since 1873 no passenger has been killed or very seriously injured in a passenger car in that State.

The record of the Samson splice bar made by Morris Sellers & Co., of Chicago, up to the beginning of the current year, is 9,881,236 bars in use; sufficient to lay 14,035 miles of track.

It is rumored that George M. Pullman has purchased the plants and the stock of the United States Rolling Stock Company, the works being at Hegewisch, Ill.. New Decatur, Ala., and Anniston, Ala.

Mr. M. N. Forney, in a journey to Washington, traveled on a fine-looking vestibuled train marked "F. F. V. Limited." He did not know at first what meaning the letters of the strange device conveyed, but before the journey was over he concluded that they stood short for "*frightfully ventilated.*"

The contractors who built the famous Forth Bridge calculate that in its construction were used 980,072 gallons of machinery and illuminating oils, 35,527 gallons of paint oils and 250 tons of paint. The quantity of oil consumed would have been sufficient to float one of her Majesty's first-class cruisers.

American manufacturers of railroad supplies and machinery have held their own in the market of Brazil for years against European competition, and they are now going to obtain a decided advantage in the race of trade by the new reciprocity treaty. That compact admits all material into Brazil duty free.

The Baltimore & Ohio are contemplating the building of 100 refrigerator cars, also 500 hopper bottom gondolas. The latter will be built after an excellent design of car, and it has the unique features of a hand rail on top of the high sides and a running board along each side. The refrigerator cars will have quick acting Westinghouse brakes and vertical plane couplers.

The Wagner palace-car shops, at Buffalo, N. Y., are to be enlarged by the erection of a new shop 140 × 458 feet, having accommodations for 23 tracks. The building is to be of brick and stone, and will cost about $60,000. Operations will begin at once, and it is expected to have the shop completed by July 1, when the company will have 68 tracks under roof.

It is said that stockholders in the Pennsylvania Railroad Company will build extensive car works at Milwaukee, Wis. A large tract of land has been secured and a company organized with a capital stock of $800,000, of which between $500,000 and $600,000 has been subscribed. They will be the finest and most extensive car works in the country. Work will be commenced as soon as the weather will permit in the spring.

About the most inferior skilled help employed by railroad companies is found among telegraph operators. They are as a class underpaid, and the companies get the quality of help they pay for. A month seldom passes without some bad railroad accident happening through gross mistakes of incompetent telegraph operators. The latest one reported happened at Rahway, N. J., where a destructive collision of passenger trains resulted from the blunder of a telegraph operator.

There was paid by the railroads of the country in 1890, $363,000,000 in the shape of interest and dividends. This sum, of course, is greater than the disbursements of this sort ever made before in any year. It is 7 per cent. larger than those of 1889, 16 per cent. in excess of those of 1888, and 22 per cent. ahead of those of 1887, and represents an amount considerably more than half as great as the bonded debt of the government, exclusive of that guaranteed for the Pacific railroads. It only represents, however, about 5 per cent. on the money invested.

Among the accidents reported last month was one on the Burlington, Cedar Rapids & Northern, where a broken rail sent a passenger train down an embankment. The cars were heated by steam, but the mail clerks did not consider steam sufficiently reliable, and had a stove in the mail car. This stove did not behave differently from other stoves that have been in cars that went over embankments. It set fire to the car, and was only prevented by fortunate circumstances from burning up the entire train. That and the tunnel accident in New York are notice enough for one month that the deadly stove has not lost its dangerous character.

The railroad employés of Kansas are urging the enactment of a law providing that an engineer must fire at least three years before taking charge of an engine, and that no man who is in the habit of getting drunk shall be employed as engineer. The bill also provides that no man shall be given charge of a train to run until he has had at least two years' experience in freight service and prohibits the company from hiring an operator under 18 years of age and who has not had two years' experience in railroad service. They also favor a law prohibiting railroad companies from deducting from the wages of railroad men funds for the support of hospitals, and they wish to make blacklisting a crime.

The passenger cars belonging to the Boston & Albany are noted for their fine outward appearance. Close attention is bestowed upon the painting, and the work is thoroughly well done in the first instance and then well maintained. Mr. Hibbard, the master car painter, is one of the most intelligent and skillful men in the craft. His usual plan is to give the cars three coats of lead as ground work. The priming is done almost exclusively with oil. After the first coat is put on the surface is sand-papered down, and considerable oil is used on the second coat which follows, but not enough to make an egg-shell gloss. A diminishing quantity of oil is used in every successive coat, a little oil being added to the coloring.

There arrived lately at the Long Island Railroad shops at Jamaica, N. Y., a new private car, for the president, Mr. Corbin, which was built in the Pullman Works at Chicago. We have examined many private cars that had been built regardless of expense, but we never saw anything nearly so luxurious as this one. The car body is 70 feet long, and is finished inside in fancy colors of mahogany, with very elaborate carving in various parts. The upholstering seems to be in the highest style of that art, the covering of seats and chairs being very fine wine-colored silk. A very rare quality of cathedral glass is used in the upper window sash. The Consolidation Company's system of heating is used, and there is a Baker heater as an auxiliary. Light is provided by the Pintsch gas system. The car is carried on two six-wheel trucks that have Allen paper wheels 38 inches diameter.

The Chicago *Inter-Ocean*, of a recent date, says: "The Pullman Company has turned out something new and handsome during the past few days. Perhaps the finest parlor cars the company has ever turned out of its shops are the twin cars Evelyn and Mercedes, which have been placed in service on the day trains of the Chicago & Alton Railroad between Chicago and St. Louis. They are 64 feet in length, vestibuled, and contain 16 revolving and 6 wicker chairs. Both the Evelyn and Mercedes contain the latest improvement, an open drawing-room, and are fitted with commodious smoking-room and buffet. Wide and spacious bay windows occupy most of the wall space, and each car contains a well-selected library. The interiors are finished in mahogany, old gold, and blue plush, and the chairs are upholstered in white mohair. The decorations exhibit exquisite taste in colors.

Most of the States that have tried the experiment of operating railroads have abandoned the practice as an expensive luxury that the taxpayers found too onerous to endure longer. Yet some politicians in Michigan are hungering after the spoils that might fall into their hands by the control of a big railroad, so they are agitating to induce the people of the State to make a forced purchase of the Michigan Central. A constitutional provision prohibits the State from engaging in railroad buying, but it is proposed to obviate this difficulty by amending the constitution at the coming spring election so as to allow the State to purchase railroads when the latter are operating under special charters. It is believed that the bill and proposed amendment are intended to be used as a club to force the Central to give up the charter privileges which now place it beyond the reach of the legislature in the matter of taxation and passenger traffic.

Railroad companies have derived so much benefit and protection from the working of the Eastern and the Western Railroad Associations that a mutual protection scheme on the same principle is likely to be introduced on a much larger scale. The associations named guarantee railroad companies against suits for infringement of patent rights, or rather take upon themselves the work and responsibility of investigating patent claims and settling them or defending suits brought against the companies that are members. The new association proposes to deal with all law suits brought against railroad companies, to investigate into and settle those that ought to be settled without suit, and to provide the means of fighting to the court of last resort unjust claims. It is said that General Counsel Keep, of the Chicago & Northwestern, who is a leading spirit in forming this association, will resign from his present position to become president of the new association.

Indiana appears to be the ideal State for the scene of a railroad strike, as there appears to be no provision whatever for restraining that class of strikers who believe in keeping other men by force from taking their places and in doing any damage to railroad property which they consider likely to aid them in the fight. During the late strike of conductors on the Chicago and Erie the strikers at Huntington, Ind., did a great deal of damage to railroad property and committed many acts of violence to obstruct the movement of trains, but the authorities vested with the duty of protecting persons and property refused to interfere. As the railroad company pays taxes in that State the same as other corporations and individuals it is an outrageous condition of affairs that the law extends no protection to the company's property. Some lawyers believe that the railroad company can collect from the State of Indiana damages for loss of earnings during the time the stoppage of trains was caused by the lawless obstruction that the officers of justice encouraged by their refusal to interfere.

A fatal and destructive accident happened on the Delaware, Lackawanna & Western Railroad, near Paterson, N. J., by which an engineer and fireman were killed. A fast passenger train jumped the track at a siding switch and made a most disastrous wreck. The railroad company have posters up at all the stations offering $5,000 reward for information that will lead to the conviction of any one who tampered with the switch and caused the accident. There is no liklihood of the company being called upon to pay the money. The offer of reward looks to us as a bluff to detract attention from the wretchedly defective stub switches that this company use at their minor sidings. If they would expend $5,000 on putting in new switches adapted for the passage of fast-running trains they would have fewer accidents. Statistics show that about 13 per cent. of all railroad derailment accidents in the country are caused by defective frogs and switches, and the Delaware, Lackawanna & Western Railroad has some of the worst switches of the many bad ones in use.

A railroad employés' club has been organized at Springfield, Ill., for the purpose of fighting the Granger policy of the Northwestern States, which has sought through unjust legislation in favor of the farmer class to oppress the railroads and cut down rates and earnings to a point that reacts upon the wages of employés and the profits of stockholders to a ruinous degree. It is claimed that, in consequence of this kind of class legislation, the number of railroad employés in the State of Iowa were 5,000 less in 1889 than in 1888, and in the same year the number of employés in Minnesota was decreased by 800, these men being laid off because the railroad companies had to cut expenses as much as possible by reducing train service and laying off shop hands to reduce their pay rolls to the lowest possible notch. They declare that the Railroad Commissioners owe their places to political influence, and in order to retain their places must show themselves on every occasion the friends of the farmers, and that the legislators have only one object in view: to pass laws which will help the farmer and win the farmer vote.

In an address at Jefferson City, U. S. Hall, a leader of the Farmers' Alliance, advocated strong legislation against trusts, and was in favor of a bill prohibiting stipulations in bills of lading, and thought railroads and express companies should be held absolutely accountable for all damage. But he opposed the making of railroad companies liable for accidents by fellow employés. How considerate the farmer legislator is of both the farmer and the railroad company's interests, that they should demand absolute indemnity to the farmer and to the public for losses; at the same time giving to railroad companies the right to kill and maim its employés with impunity, and place in its service, without restriction, the scum of creation with nothing but their property to risk. When two or more combine to demand decent treatment, the safety of the hog and commerce must be protected, and while these conditions are being fixed they must compromise on something or somebody, and in New York and Missouri it seems to be the railroad employé. Human life and the blessings of liberty seem to be of little account if they be railroad employés.—*Locomotive Engineers' Journal.*

Jersey Central Repair Shops.

EQUIPMENT OF THE ROAD.

The Central Railroad of New Jersey is the least mentioned among the leading lines that connect New York with the Western world, yet it is a great property, doing an immense transportation business. The lines twist and reach through the greater part of New Jersey, and fold themselves up through a portion of Pennsylvania, always following lines of communication that form natural drainage for the carrying trade. The company's lines are only about 650 miles in extent, but to operate the roads they require 400 locomotives and 36,000 cars, of which 425 are passenger cars. Besides that equipment the company uses in its business 4 steamboats, 5 ferry-boats, 5 tugboats, 16 car floats and 1 collier steamer. In one year they have moved close on 1,000,000,000 tons one mile, or, to put it more comprehensively, 1,000,000 tons 1,000 miles. As the runs made are mostly less than 100 miles the amount of handling called for by this immense traffic is stupendous. They carry about 170,000,000 passengers 1 mile annually.

POLICY OF NEGLECTING MACHINERY.

A peculiarity about the Central Railroad of New Jersey is that there is less attention bestowed upon providing means for keeping in order the machinery that operates this immense traffic than any other railroad in the country. The company has always been run on a mean, small scale, and the prevailing zeal for saving cents is constantly wasting dollars. The company has the reputation of being the most penurious in the payment of its officers and men of any company running out of New York. With the shortsightedness that might be expected of such a corporation, it wastes many thousands of dollars annually in performing locomotive and car repairs in a multitude of dog-holes stuck all over New Jersey and eastern Pennsylvania, because it would call for a large lump expenditure to build decent shops where the work could be concentrated and done cheaply.

LAME MANUFACTURING HEADQUARTERS.

The mechanical headquarters of the road are at Elizabethport, about 10 miles from New York, crowded into an assortment of sheds that have grown like parasites upon buildings originally designed to handle one-twentieth of the business now done. During a recent ramble through this accumulation of ancient shanties, we were surprised to find that the place not only turns out a very great volume of work, but does it well. Four or five years ago we visited the place and found the late William Woodcock, master mechanic, wrestling over the difficulties of getting work done decently, but buoyed by the expectation that new shops would be built next year. This year of grace finds Master Mechanic Hoffecker toiling with the same accommodation as his predecessor sweated over five years ago, and the volume of work has been greatly increased. We always hear it said that an apprentice mechanic learns the trade best in a shop where they are deficient in facilities for doing work. The Elizabethport shops must be a fine training school for mechanics. The good tools are scarce, and the work to be done large and diverse in character. This is the manufacturing center for the road, and everything from the repairing of a station clock to the rebuilding of a steamer's engines is supposed to be done here. One shop is entirely devoted to switch work, and specimens of every mechanical appliance used on structure or buildings may be found here undergoing repairs. The versatility of the place is really wonderful. There once was a locksmith who had a small shop in a certain village of which we wot. This artisan made or mended locks to meet a limited demand, but he also repaired clocks and was willing to put in running order crippled wheelbarrows, and he was reported to be skillful in upholstering sofas and chairs. He could solder leaky pans, and he was accomplished, when other work was scarce, in fixing up a pair of dilapidated brogans. Besides these lines of usefulness it was said that he made a practice of surreptitiously shaving his friends, thereby beating the village barber out of legitimate business. While going through the Jersey Central shops we could not help thinking how much at home our old locksmith would have been here.

MAKING THE BEST OF OPPORTUNITIES.

We noticed that Mr. Hoffecker had made a good many changes on the arrangement of tools which helps him to crowd out the work. They are not doing piecework, but there was an air of that through the shops, every man being busy and no lounging to be seen. Within the year 550 locomotives were in these shops for repairs, 112 of the engines having received heavy repairs. The feed water is bad and a firebox does not run more than three or four years before new side sheets have to be put in. The greater part of the engines burn hard coal, and have large fireboxes necessary for the slow combustion. The sheets begin to crack about in line with the top of the fire after two years' service, and after cracking begins it soon makes patching or new sides sheets inevitable. Instead of putting on a patch at every bad spot, Mr. Hoffecker puts in a half side sheet and this will wear out the firebox.

CURIOUS ACTION OF FIREBOX SHEETS.

The intense local heat that the sheets receive from the hard-coal fire in these long fireboxes exerts a peculiar effect. A small piece of sheet which was taken from the line of the greatest heat was covered with tiny cracks on the side exposed to the fire. When examined through a strong magnifying glass, the surface of the sheet appeared to be disintegrated with cracks, some of them being sufficiently developed to go about half way through. It looked as if the constant expansion and contraction due to changes of temperature had been sufficient to overcome the force of cohesion of the atoms composing the steel, and that the surface was held by the portion of the sheet exposed to the water.

THE PAINT SHOP.

At some distance from the car and locomotive shops they have a very good paint shop, where the large passenger equipment is kept looking respectable. Here they keep 56 painters and over 40 car washers hard at work. Last year they repainted 119 cars, besides cleaning and revarnishing 295 others. A little work done in addition to that was the painting, weighing and lettering of 5,576 freight cars.

GOOD REPORT FORM.

Mr. Hoffecker has in use a very convenient form of report sheet which is a blank with nearly every detail of a locomotive mentioned in one column and a wide line left for mention to be made of any work that has been done. There are 50 headings given, which comprise the greater part of an engine necessary to mention. When an engine comes out of the shop a report is filled out on one of these blanks, giving particulars of when the engine was taken in, when she went out and the work done to each part. The same blanks are used by division foremen to report on the condition of the engines under their charge; and of course all the work done in round-houses or out of station shops is reported in the same way.

LESSONS OF THE PLACE.

We consider a visit to the Elizabethport shops a good mental discipline. Any master mechanic who is harassed getting work done without decent facilities should come here and witness how much worse off other men may be. That the man who faces the music here day after day comes forth with a smiling face and undespairing mien is evidence that no position can be too hard or too disagreeable not to be acceptably filled.

Long Island Railroad Shops.

ARRANGEMENTS OF SHOPS.

About a year ago the Long Island Railroad Company finished the erection of five new shops for locomotive and car repairs at Jamaica, about ten miles from New York. The buildings were planned and erected to suit the views of Mr. C. A. Thompson, master mechanic and car builder. The shops are arranged on the parallel plan, the machine shop and boiler shop occupying the same building, 425 feet long and 100 feet wide, while the car shop and the permit shop take up another building 550 feet long by about 90 feet wide. A transfer pit divides these two shops and the table thereon handles the engines or cars going to and from the shops. The transfer table is long enough to hold a passenger car and switch engine together. The roundhouse is at the opposite side of the machine shop from the car shops and is set toward one end and partly in line with the blacksmith shop which is a separate building at the end of the transfer table between the machine shop and car shop. Adjoining the blacksmith shop are the tinsmith shop, boiler room and water tank. The arrangement of the buildings is very good and they are all readily reached by tracks. Beyond the car shops are large sheds and ample track accommodation for the repairing and storage of cars.

The details connected with the arrangement of the shops have been carefully carried out and the numerous small conveniences that facilitate work and prevent unnecessary labor have been well attended to. Water is conveyed to all parts of the shops in overhead pipes, and hydrants are placed on a plan that permits the concentration of streams in case of fire in any part. Steam is led from the boiler house to the various shops, each shop having its own power provided by a Westinghouse engine. All the engines, exhaust into heating pipes which traverse the various shops and drain into a common trap in the boiler house, from which the water is retuned to the boilers. The heating-pipe surface is so large and the condensation so great in winter that the exhaust steam passes into a slight vacuum.

CONVENIENCES FOR AIDING WORK.

There are several points about the machine shop of these works that are well worthy of the attention of those having the building of new shops in view. It is a one-story building with a monitor roof that greatly aids in dispelling the least appearance of darkness, even in Long Island's most sombre days. On one side of the shop are the engine-repairing stalls and on the other side are the tools, the latter being grouped to suit the successive movements of material undergoing work. Two overhead traveling cranes traverse the stalls and the same side of the boiler shop, there being no dividing wall between the two shops. The cranes are not carried by the walls, but by separate stringers supported by posts that rest on their own foundation. When both cranes are at work they cause no vibration or shaking of the building, which is very different from some shops having overhead cranes. The cranes do all the lifting of engines and the moving of heavy material in the shops, and Mr. Thompson, who is a particularly close figurer on expenses, says their use has dispensed with the services of sufficient laborers to pay for the interest on the outlay. Here, as elsewhere, however, the tendency is to make those ponderous cranes do work that ought to be done by hand. The crane must be called upon to lift a sand-box lid from the floor to its place.

DIVERSITY OF ROLLING STOCK TYPES.

The Long Island Railroad now embraces the whole of the surface railroads on Long Island, and is made up of what were originally ten or twelve different short lines, each with a diversity of car and locomotive equipment. The condition of diversity can be imagined, when the product of this variety of lines, doing a big business at certain times of the year, is collected into one. I believe that a greater variety of engines and cars can be seen in the Jamaica shops than can be found in any railroad shop of America. Mr. Thompson is a modest man, and is not spoilt with overweening pride of the collection of curiosities under his charge. He is like a farmer in Indiana who had fifteen children. Some of them were pretty and some of them were plain. There was light hair and black hair among them, while red, brown and yellow kept up the diversity. The color of the eyes was as diverse as the shapes of the noses. There were black eyes and blue eyes, squint eyes and straight eyes, and the shapes and dispositions were as diverse as the other details. A book agent of an inquiring mind who called at the place one day, ventured to ask the father how it came that there were so many "types" among his children. "Well, Boss," replied the father, "I never was a printer, and don't know nothing about types. My job is findin' hog, hominy and duds for the young 'uns, and they'll get 'em or I'll bust." Mr. Thompson is doing his best to keep his odd family of rolling stock in decent shape, and the five shops are kept full of work.

One of the quickest jobs of repairing a disabled engine I have ever seen was done when our party was in the shop. An engine with a bad truck wheel was run into the shop. They blocked the back wheels, hooked the overhead crane to the front drawbar casting, and raised the front end sufficiently to take out the truck. Another truck which was ready was run under, and the engine went out within fifteen minutes. It was not a special effort either, for none of the men doing the job were aware that there was a "chiel amang them takin' notes."

Has the Fontaine Skin.

A Milwaukee paper gives the following account of the newest madness in locomotive inventing. If the machine is not a brother of the Fontaine locomotive of amusing memory it has a remarkably close family likeness, the principal difference in appearance being the extra tier of wheels.

The owners of what are called the Holman-Caldwell patents are having fitted up in Milwaukee a locomotive to be equipped with a new style of running gear, which its owners think will accomplish great things in railroading. The new running gear consists of a truck with 10 wheels, three of which on each side rest upon the rails, and are surmounted by two others, the tires of which have frictional contact with the tires of the wheels below. Then, surmounting these two wheels is the drive wheel of the locomotive, the wheel arrangement on each side of that being that of a pyramid, with the drive wheel on top. As the lower sets of wheels are of much smaller diameter that the drive wheels which transmit motion to them, it is claimed that the ordinary speed of a locomotive can be doubled by the use of this gearing. A stock company has been formed to exploit the invention, and as soon as possible a trial trip is to be made. It is proposed to first run the engine now being equipped from Minneapolis to Boston. Representatives of the Holman-Caldwell Company have been in Milwaukee for several days looking after the construction of the trial truck and exhibiting models of the invention to railroad men.

Kicking Good Will.

For two years we have been laboring with railway officials in this part of the vineyard, trying to convince them that it was wrong to treat with stool pigeons, politicians and agitators relative to any grievance or misunderstanding that might exist between the men and the management. The walking delegate is interested in keeping a good supply of "grief" on hand at all times. If a railway official does a nice thing—establishes a free library, or gives a thousand dollars worth of books to some hospital—the agitator riseth in the lodgeroom and saith, in a loud Anheuser-Busch voice: "Beware; they are laying for you, and some day—ah, my dying hearer—some day, I know not when, you will be seated in the free reading room perusing some pathetic story, when to your horror you will discover that it is not the *Police Gazette*, but a copy of the *Western Railway* or the *Youth's Companion* the designing company has run in on you." But in spite of the wail of the agitator the managers in the West are refusing to talk with them. The days of the walking delegate are numbered. The brotherhoods are beginning to discover that there are just as smart men at work as there are among the woe-erasers and funeral directors.

—*The Western Railway.*

Repairing Locomotives.

BY J. T. HEFFERNAN.

As the putting on of new cylinders on old engines is a job that has to be done pretty often in repair shops, the following method may be interesting to those who have this work to do:

After removing the old cylinders dress up the fronts and put them back in place, put the guide yoke on and bolt the fronts to it with temporary bolts. Now set the fronts level with the main frames, both longitudinally and across. Run a line on each side parallel with the main frame and set the fronts in line, sidewise, with the main frames. The fronts should then measure the same distance *G*, Fig 2, as the cylinders measure at *D*, Fig. 1. By setting the fronts in this manner we get the correct position which they will be in when fastened to the cylinders.

Now, to locate the position in which the cylinders must be fastened to the fronts in order for the guides to fit between the back heads and the guide yoke: Lay a straightedge across the fronts at a distance from the guide yoke equal to the length of the guide and draw a line on each

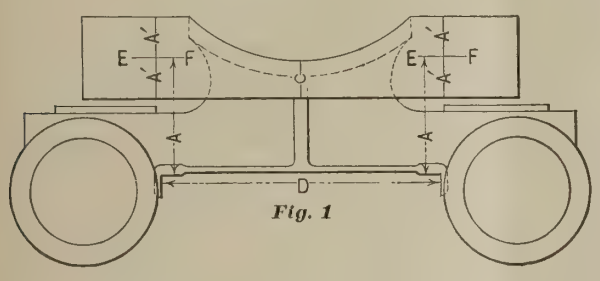


Fig. 1

front. This line corresponds to the position the back cylinder head must be in when the cylinder is fast to the fronts. From those lines measure the distance to the lugs—generally the back lugs are the ones used to bring the cylinders to, and the front lugs used for the wedges—this will give the distance from the face of the back heads to the cylinder lugs, or the measurements may be taken from the joints and the thickness of the heads allowed for. Be very careful in chipping the lugs to make them the exact distance, otherwise when the cylinders are keyed to the fronts they will be in a twist. After chipping the back lugs measure the distance apart of the lugs on the fronts and lay the distance off on the cylinder, less the thickness of the key required. It is a good plan, and is more convenient to make the joints for the heads before hanging the cylinders. The cylinders are now ready to lay out the saddle. Lay off on the smoke arch, about where the saddle will come, the dimensions of the saddle. This is done merely to guide us in fitting the templates. Now, take two pieces of board, as shown in Fig. 3, about ½ or ¼ inches thick, and fit them to the smoke

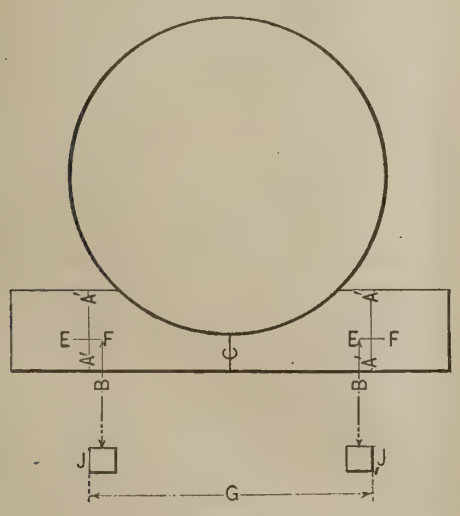


Fig. 2

arch, as shown in Fig. 2. Fit one of them where the forward edge of the saddle will come, and one where the back edge will come. Fit those templates very close and mark them Front and Back. After having fitted them to the arch, put them on the arch, and fasten them there. Lay a straightedge across the fronts and draw the lines *A' A'* on the template square with the top of the fronts and in line with the sides, *J J*. Lay those lines out on each template. Those lines should be laid out on the front side of the front template and on the back side of the back template. Now take a distance, *B B*, Fig. 2, from the top of the fronts, and draw the lines *E F* parallel to the straightedge laid across the fronts. The lines *E F* should be laid out an equal distance on each template from the top of the fronts.

We will now put a center line on the smoke arch Find the centers on the templates between the lines *A' A'* and draw the line *C*, Fig. 2. Do this on each template. After finding the centers, line *C* on the template—we mark it on the arch. This done, remove the templates from the arch, and clamp them in their same relative positions on the cylinder, as shown in Fig. 1. Clamp two straightedges or parallel strips against the frame fit on the cylinders. Place a straightedge across those two, and move the templates so the lines *A' A'* on the template will be in line with the sides of the frames fits. Now, with a distance equal to *B*, Fig. 2, and measuring from the top of the frame fit as at *A*, Fig. 1, we move the template so as to bring the distance *A A*, Fig. 1, equal to the distance *B B*, Fig. 2. Do this on each template. This brings the templates in the same relative position on the cylinders that they occupied on the smoke arch.

A center line may now be drawn on the cylinder from the center line *C* on the template. Now scribe around the saddle, using the template as a guide. Do this both forward and back. Try a straightedge on the arch about where the side of the saddle will come, and if it is found to be nearly straight, lay off the corresponding side of the saddle straight. Go over the other side just the same. In case the arch is very irregular allowance may have to be made for it, but, generally, any little variation may be corrected by drawing the bolts, and laying up the sheet after the cylinder is under. After laying off the saddle all around, proceed and center the lines and chip the edges down to the center lines. A template as shown in Fig. 4 may be used to serve as a guide in chipping, but as a rule it is not necessary. If used it must be fitted to the template Fig. 3, and the center

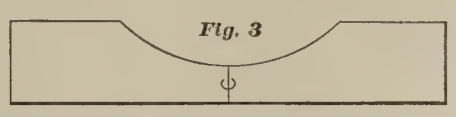


Fig. 3

line *C* marked on it. After chipping down the edges take a chisel and cape the lugs at intervals of about two inches apart, and down so as to be even with the edges of the saddle. Those cuts will serve as guides to chip the ribs to. If there is much stock to come off, the work may be greatly facilitated by chipping square onto the ribs and breaking off the corners. This will remove most of the stock and the balance may be removed by chipping in the usual manner. If a little care and judgment is used in laying out and chipping the cylinders, it will be found when the cylinders are put up for the first time, that they are a fit and will not need to be taken down again.

After the saddle is shipped, fasten it to the arch by blocking or any convenient means, and bring the center line on the cylinder to the center line on the arch. This insures the cylinders being in their right place. Put the fronts up now, and move the cylinders forward or back so

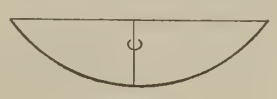


Fig. 4

as make the fronts butt firmly against the frames, at the same time being careful to keep the center line on the cylinder with the center line on the arch. The cylinder may now be drilled to fasten to the arch. It is good practice when fastening the cylinder to the arch to use a piece of ¾ inch × 3 inches iron on each side and letting the bolts go through them. This gives the bolts a firmer hold on the arch, and if the pieces can be made to butt against the sheet or ring it is all the better. There should be a boss cast where each bolt hole will come on the saddle, as this insures a good firm contact between the cylinder and the sheet. The arch bolts should invariably be driven from the inside. It has been my experience that the fitting of cylinders by the use of templates has a very decided advantage over the method of laying them off by running them under and marking them off from the boiler. It is quicker, and in case you have an engine running and you want to put new cylinders under and not hold her in long, the templates may be laid off from her and the new cylinders got ready before she comes in the shop. This way is very good for new work, for then lines can be run and the centre of the cylinders used to lay out the template from, instead of laying out from the frame fits, as done in repair work.

Rigid and Swing Motion Trucks.

At the January meeting of the Southern Railway Club a paper by Mr. A. G. Steinbrenner on the above subject was read and discussed.

Mr. Steinbrenner thought that the question of rigid and swing motion trucks should be considered from the standpoints of safety, durability, and on what will produce the best general results. He favored the use of the rigid center truck because it has proved more durable than those with the swing center. The claim is made that the swing motion truck decreases the flange wear, but he had failed to find data to substantiate this, and it appeared to him that the difference in first cost and in the expense of maintenance in favor of the rigid truck would offset any saving of the other in flange wear. Their records show that there is nothing in favor of the swing motion truck in respect to flange wear, under the American Refrigerator Transportation Company's equipment. During the first eight months of 1890, there was a total of 421 wheels removed from 550 A. R. T. cars with swing motion trucks, on account of sharp flanges, 355 wheels at A. R. T. shops, and by 66 by foreign roads; and a total of 400 wheels removed from 450 cars with rigid trucks on account of sharp flanges, practically the same for both classes of trucks. The data being taken from the general run of the equipment, the figures are not as accurate as if wheels corresponding in number and make were applied to the two different classes of trucks, and put under the same kind of cars of like capacity, and the mileage considered. At the A. R. T. shops, on removing wheels no perceptible difference was shown in the end wear of brasses or collars of journals. The unnatural vertical movements of the swing motion trucks under heavy loads, and the heavy rocking strains, materially shorten the life of springs, and the draft gear suffers from the heavy twisting strains caused by the motion given to the car by this form of truck. When the swing beam trucks carrying 30 tons enter a curve at high speed, the beam and hanger movement is very great in the direction the load takes, and the results are taken direct to the draft gear and end of car. The unnatural course of the car body makes this a source of danger. With a rigid truck when entering the curve, the flanges of wheels take their position against the outer rail, and their relation to the car body as regards lateral motion remains unchanged.

Mr. Steinbrenner believes that the fact of so many more cars with the swing motion truck being wrecked than those to which the rigid are applied proves the swing motion to be the undiscovered source of many wrecks. The A. R. T. Co.'s equipment of 1,200 cars, divided into 550 swing motion and 650 rigid, reaches every section of the United States, Canada, and Mexico, the average mileage of each car being about 24,000 miles annually. The relative merits of the two classes of trucks ascertained from the company's records, proves that for a period extending over five years, eighty per cent. of the repairs have been applied to cars equipped with swing motion trucks. Among the advantages of the rigid trucks is the reduction of the number of parts, and the assurance that inspectors cannot fail to discover any existing defects. It was Mr. Steinbrenner's opinion that the substitution of improved frictionless bearings for the present old style side bearings would be a material improvement, for in spite of all manner of trussing, the bolsters will not carry the load at centers, but transfer a part of it to the side bearings. With frictionless bearings and elastic springs, the truck will take the curve in proper form, and thus save flange wear. He also claimed that freight cars equipped with the rigid motion reach their destination with the freight in much better condition than with the swing motion. He recommends the adoption of the rigid truck especially for the large cars in the present course of construction, in conjunction with a device to reduce the friction between body and trucks.

In the discussion that followed it was generally agreed that the rigid trucks were favored more on the score of economy than that of mechanical construction. Mr. Cullen thought the proportion of the hanger had much to do with the success of the swing motion trucks under cars. For hangers 18 inches long he thought the inclination outward at the bottom should be 2½ inches. He believed if the life of the car body and the expense of maintaining it were considered, as well as the cost of the trucks, the figures at the end of the four years would show in favor of the swing motion truck, notwithstanding its greater first cost.

Mr. Charpiot said if the swing motion truck was suitable for 40,000 lbs. cars, it should be of advantage under heavier cars, if it were properly proportioned for the increased load.

Mr. Cullen found the tin roofs of freight cars lasted much longer on cars having swing motion trucks. He had also used heavy links and pins with advantage.

Mr. Charpiot said if properly made the swing truck caused but few wrecks, the side bearings being a greater source of danger, whether on rigid or swing truck, and it was the general opinion that the swing truck, if not made strong enough, caused a great deal of trouble.

Discussing Car Wheels.

The New York Railroad Club has a fondness for discussing the subject of car wheels. We think there is nothing respecting the manufacture or the wear of car wheels which has not been worn threadbare at the meetings of this club. When there is any difficulty in obtaining a subject for the consideration of the members "car wheels" bobs up, a crowd of people attend, and the ancient information is poured into attentive ears; the familiar remarks are sounded, and the members retire believing that they have enjoyed a delightful meeting.

At the February meeting of the club Mr. Samuel Porcher, of the Pennsylvania Railroad, read a paper on "The best Diameter of Car Wheels." He favored the use of wheels 36 inches diameter, and considered that the best size of wheel for ordinary car service. The paper made out that cast-iron wheels were the most economical to use. The average mileage made by this kind of wheel on the Pennsylvania Railroad was said to be 60,000 miles. This mileage is obtained from cast-iron wheels at a cost of about $5, which is considerably less than the cost of running steel-tired wheels.

There was some diversity of opinion among the members as to the best size of wheel, but most of the speakers favored 36 or 38 inches.

The relative merits of cast-iron and steel-tired wheels occupied the greatest attention of the speakers. The majority preferred steel-tired wheels on account of the safety insured. Mr. Adams, of the Boston & Albany, said that with an experience of twenty years with steel-tired wheels they had never had any to break.

Mr. P. H. Griffith, of the New York Car Wheel Company, read a paper on "Recent Improvements in Process of Manufacture of Car Wheels," which was discussed principally by other wheel makers.

On Irregular Wear of Locomotive Tire.

The tendency of locomotive tire to wear irregularly, that is, to form flat places, or to wear the thread out of its original cylindrical form, concentric with the journal, is one of the most annoying and expensive of the minor trials to which a railroad master mechanic is subjected. This trouble is aggravated when roads pass through sandy districts. At first sight the most natural conclusion is that the tire varies in hardness, or resistance to abrasion, and this undoubtedly is the cause of a portion of the trouble, but from an extended series of observations, the writer is compelled to conclude that a material portion of the trouble lies outside the tire itself. This conclusion has been arrived at from the following observations:

First.—The tire of several locomotives, showing serious flat places, have been slipped around on the center, then trued up and placed in service. The flat places in every case formed again at the same place relative to the center, but in a different place on the tire.

Second.—Observations made on a large number of tire running in a sandy district, showed that the flat places grouped themselves with a close approach to uniformity, occupying nearly the same position with reference to the pins and counterbalance.

The above clearly indicates that there are cases of irregularity in the wear of tire due to the forces which are in action in operating the locomotive, and it is the purpose of this investigation to partially determine the nature, extent and influence of these forces.

For this purpose engine 316 was taken, the dimensions bearing on the question being as follows:

Diameter of cylinder, 16 inches.
Stroke of piston, 24 inches.
Diameter of drivers, 62 inches.
Total weight on drivers, 54,000 pounds.
Boiler pressure, 160 pounds.
Cylinder pressure, 130 pounds.
Cut-off, 6 inches.
Speed per hour, 40 miles.
Weight of reciprocating parts, each side, 480 pounds.
Weight of main rods, 269 pounds.
Weight of main rod taken as reciprocating, 117 pounds.

The total weight of reciprocating parts was counterbalanced, the counterbalance being equally divided between the wheels.

With the above data Table 1 has been computed, showing the forces in action at each ten degrees of a revolution, the zero point being taken as that point at which the right hand driving wheel pin passes the forward center.

FORCES IN ACTION ON ENGINE 316 MOVING AT 40 MILES PER HOUR

Degrees.	Weight on Rail. R. F.	L. F.	R. B.	L. B.	Total.	Rotative Force at Pin.	Ratio of Rotative Force at Rail to wt. on Rail.
0	13,500	19.230	13,500	17 340	63,570	12,910	.081
10	13,216	18.974	12,836	17,282	62,308	15.283	.098
20	12,985	18.702	12.187	17,105	60,979	18,377	.121
30	12,831	18.237	11,580	16,825	59.470	20,467	.137
40	12,742	17.598	11,035	16,441	57,815	22,268	.154
50	12,733	16,811	10,559	15 965	56,068	53,407	.167
60	12,539	15,979	10,175	15,420	54,113	22,378	.165
70	12,052	15,049	9,895	14,813	51,809	17,924	.138
80	11,799	14,079	9,718	14,164	49,760	14,365	.119
90	11,632	13,500	9,660	13,500	48,292	13,793	.112
100	11,578	13.916	9,718	12,836	47,348	15,879	.135
110	11,545	12,985	9,895	12,187	46,612	17,5 0	.151
120	11,555	12,831	10,175	11,580	46,141	18,733	.163
130	11,599	12,742	10,559	11,035	45 935	20,004	.175
140	11.724	12,733	11,035	10.559	46,051	21,108	.185
150	11,945	12,539	11,580	10,175	46,239	20,222	.175
160	12,228	12,052	12,187	9,895	46,362	16,279	.140
170	12,641	11,799	12,836	9,718	46,994	13,870	.119
180	13,500	11,632	13,500	9,660	48,292	13,793	.112
190	14.575	11,578	14,164	9,718	50,035	15,308	.123
200	15,648	11,545	14,813	9,895	51,901	16,290	.126
210	16,697	11,555	15,420	10,175	53,847	17,938	.126
220	17,641	11,599	15,965	10,559	55,764	17,179	.123
230	18,495	11,724	16,441	11,035	57,694	17,496	.120
240	19,232	11,945	16,825	11,580	59,582	18,105	.120
250	19,408	12,228	17,105	12,187	60,928	15,745	.104
260	19,311	12.641	17,282	12,836	62,070	12,779	.082
270	19,230	13.500	17,340	13.500	63,570	12,910	.081
280	18,974	14.575	17,282	14,164	64,895	14.712	.090
290	18,702	15,648	17,105	14 813	66,268	17,137	.104
300	18,237	16,697	16,825	15,420	67,179	18,672	.112
310	17,598	17,641	16,441	15,965	67,645	19,443	.117
320	16,811	18,495	15,965	16,441	67,712	19,796	.117
330	15,979	19,232	15,420	16,825	67,546	20,261	.120
340	15,049	19,408	14,813	17,105	66.375	17,390	.105
350	14,079	19,311	14,164	17,282	64,836	13,274	.081

This table shows in the first column the position of the wheel by degrees. The second, third, fourth and fifth columns show the pressure of each wheel against the rail, with the engine moving at 40 miles per hour. The pressure of the two back wheels varies from 9,660 pounds to 17,340 pounds, or 3,840 pounds above and below the static load of 13,500 pounds. This variation is due entirely to the influence of the centrifugal force of the counterbalance. The pressure of the two forward wheels is subjected to precisely the same influence from the counterbalance, and in addition to this the angularity of the connecting rod effects a decided modification of the pressure on the rail.

The sixth column headed "total" shows the sum of the pressures of the four wheels upon the rail. The total pressure varies from 67,712 pounds to 45,935 pounds, a difference of ten tons. The sixth column is represented graphically in sheet No. 2.

The seventh column shows the pressure against the pin normal to a line passing through the centres of pin and wheels, or the force at the pin tending to produce rotation. This column is represented graphically in sheet No. 3. The rotative force at the rail can readily be deduced from these figures.

The eighth column shows the relation between the forces producing pressure on the rail and the forces which have a tendency to cause the tires to slip. The figures are obtained by dividing the force tending to slip the drivers, or the rotative force at the rail by the pressure on the rail. We will call this ratio the coefficient of slip. It corresponds in form and relation to what is known as the coefficient of friction. If the value of the coefficient of slip is equal to the coefficient of friction the wheels will be on the verge of slipping.

Sheet No. 4 is a graphical representation of these values.

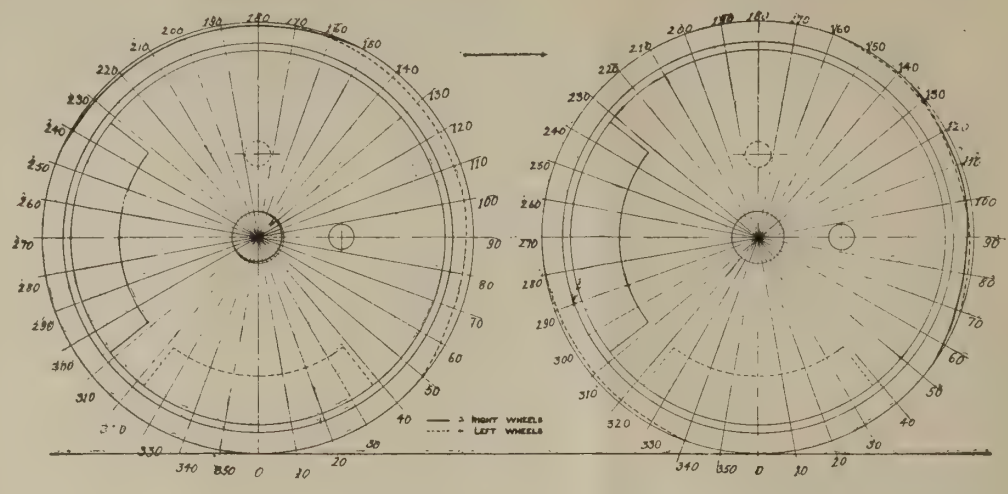


Fig. 1.—Showing Wear of Tires.

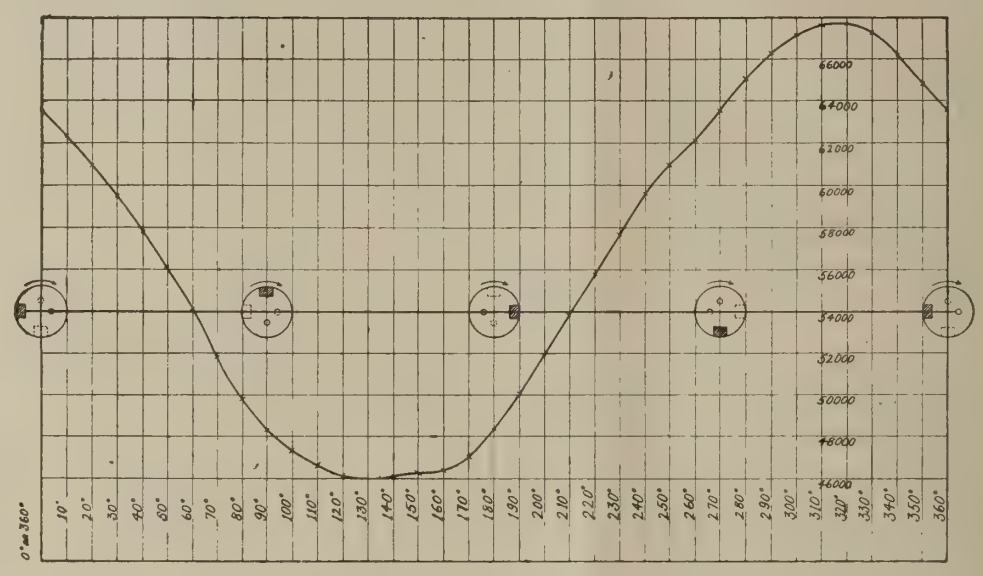


Fig. 2.—Showing Total Pressure of Drivers on Rail.

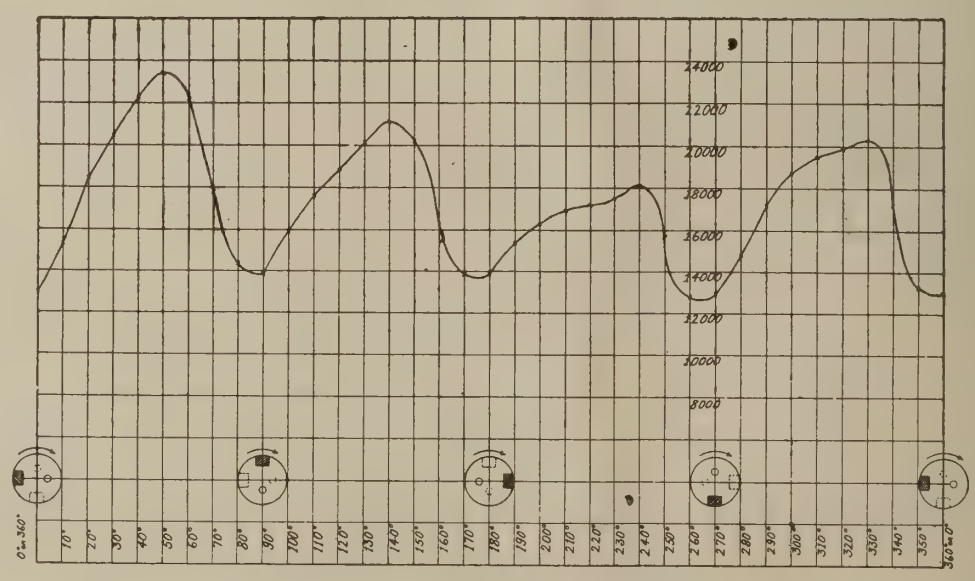


Fig. 3.—Showing Force Acting Against Pin to Produce Rotation.

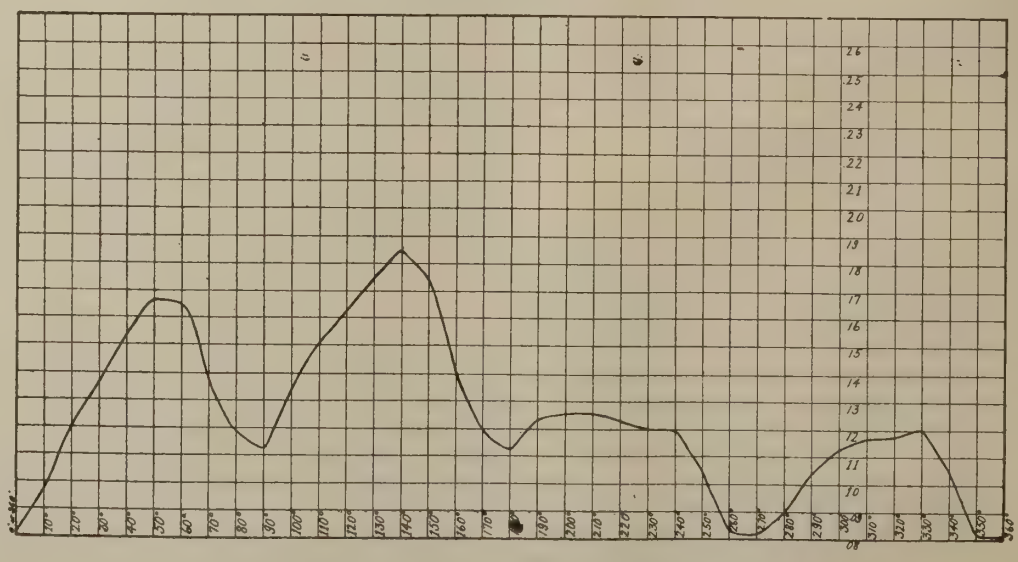


Fig. 4.—Showing Ratio of Rotative Force to Weight on Rail.

DIAGRAM ILLUSTRATING MR. BARR'S PAPER.

The coefficient of friction between wheels and rails or the coefficient of adhesion, is given by Haswell as follows:

TABLE No 2.

CO-EFFECIENT OF ADHESION UPON DRIVING WHEELS.

CONDITION OF RAIL.	European practice.	American practice.
Rail very dry	.3	.33
Rail very wet	.27	.25
Ordinary condition	.2	.222
In misty weather	.15	.2
In frost and snow	.09	.16

These figures are obtained by dividing the horizontal force applied to wheel at the rail, that is just sufficient to produce slipping, by the pressure of the wheel on the rail, and can be compared directly with the values given in the eighth column of Table 1.

We will now proceed to apply the data given in Table 1 to a case of wear taken from actual practice and illustrated in Sheet No. 1. The wear is shown by full lines for the right hand wheels and dotted lines for the left hand wheels. The depth of wear as shown is exaggerated to prevent confusion of lines, and shows just twice as great as the actual wear.

On the forward wheels there are two flat places of about the same size in the same location. This varies from the general results as in most cases the flat place on the right wheel is much less than that on the left wheel, and there seems good reason to believe that the flat place on the right hand wheel has been modified by a soft place in the tire.

By referring to Table No. 1 it will be seen that the coeffi cient of slip at 50 degrees is .167, and that this exceeds the coefficient of adhesion for a frosty rail, and that it approaches uncomfortably close to the coefficient of adhesion for ordinary condition of rail. The tendency to slip slightly, or to what is known as imperceptible slip, must be quite decided under these conditions.

A corresponding flat place is found on the left back wheel, but the right back shows no flat place. Several cases show some wear on the right back wheel corresponding with that of the left back wheel, but always less in quantity, and in this case doubtless more careful measurement would have shown some wear.

Considering the four flat places as shown in the neighborhood of 80 degrees, why do they vary, always being greatest on the left-hand tire? An inspection of the weight on rail seems to show the reason quite clearly. Table 1 shows the pressure of the four wheels on the rail at 60 degrees to be as follows: L. F., 15,979 pounds; L. B., 15,420 pounds; R. F., 12,539 pounds; R. B., 10,559 pounds, and the average size of the flat places correspond with these pressures. There are two other flat places on these wheels, one on the right back at 200 degrees, and one on the left forward at 310 degrees, which can scarcely be accounted for by slips, but are likely due to soft places in the tire.

As the speed of the engine increases, the coefficient of slips is varied by the increased intensity of the action of the centrifugal force of the counterbalance. A change in steam pressure and cut off also affect these values.

There is a possibility that further and closer observation, covering a sufficient number of cases to eliminate the question of variation in the hardness of the tire, will develop the following: Flat place will be found near the 60 degree point vary ing as shown above. Flat places will be found near the 140 degree where the coefficient of slip reaches .185, but much less than the preceding on account of light total pressure on the rail, and all nearly of the same size, as the pressure of the wheels on the rail are all four nearly equal. Very slight flat places may also be found at the 320 degree point and the 320 degree point, which are two other maximum points of the coefficient of slip.

It would appear from a comparison of the flat places with the weight on rail, that when the pressure does not exceed 11,000 pounds the tendency to abrasion from imperceptible slip is very slight.

The conclusion to be drawn from the above may be summarized as follows:

1. Flat places on driving wheel tire are not entirely due to lack of uniformity in the wearing quality of the same.

2. The flat pieces have a tendency to group themselves where the coefficient of slip is greatest.

3. They vary in depth with the pressure of the rail, and when the pressure does not exceed 11,000 pounds the imperceptible slip produces but little abrasion.

4. Imperceptible slip does not appear at random on any part of the wheel, but in special localities, as fixed by the maximum values of the coefficient of slip.

5. The counterbalance should be as light as possible com pared with the reciprocating parts, consistent with smooth riding.

6. The weight of the reciprocating parts should be as light as possible.

Painting and Varnishing Cars.

At the February meeting of the New England Railroad Club Mr. Charles Richardson read a paper on "The Painting and Varnishing of Railroad Rolling Stock." After dealing in a general way respecting the importance of the subject, the author said:

The quality of the material used is more important than the price. Many of the articles, such as oil and varnish, should be bought in large quantities, allowing them time to become well settled before using. The constant changing from one color manufacturer to another is apt to make trouble in matching shades, which means loss of time. All material should be pure and finely ground.

The mixing or preparing of the paint, as far as practicable, should be in the hands of one person, who should weigh and measure each article, rather than guess at quantities. By this means you have uniformity. I have known the same material to be mixed by two persons, presumably after the same formula, and yet differ greatly in appearance. Heavy coatings are not advisable; light coatings dry quicker, harder, and are less liable to crack, scale or fade. Always use pure linseed oil. A poor pigment with pure linseed oil is more satisfactory than pure pigments with adulterated linseed oil.

I notice that the Pennsylvania Central road has somewhat departed from the line of the other roads by employing a chemist to look after their business in this department, and analyze their paints and oils and other articles used in that connection. That is a step in the right direction. I have read with great pleasure some contributions to the *Engineering Journal* by Dr. Dudley upon this subject. It sometimes happens that certain things may be established in the painting department or the laboratory and work satisfactorily there, under cover, but outside you get quite different results. You may have a house well painted, using the best of materials, and the work may be quite satisfactory as far as the house is concerned; but if you put that house on wheels, and roll it through the atmosphere at the rate of fifty miles an hour, let it travel continuously between Boston and New York, you may find that the paint work turns out very unsatisfactory, that it is not adapted to a car in transit. The chemist can give you points as to the mixing of colors; what colors are harmonious, which have an affinity for others. Your colors may fly, or spot, or be striped, on account of chemical action which takes place when they are combined with lead. I notice that Dr. Dudley is in doubt whether pure lead is the best to mix colors with under all circumstances. In cases where the painting proves unsatisfactory, you may find on examination that when pure lead and pure linseed oil are mixed, there is perhaps oxidization, or a soap-like substance is formed on the surface, which has a tendency to wash off and leaves the pigment without anything to protect it; or tracks will form, through which the water goes, and the paint has a tendency to wear off more rapidly. From some experiments made some years since by an expert painter with different colors, where pure lead was combined with pure zinc, also with zinc and barytes, also with zinc and silex, in mixing the paints, with perhaps other combinations, it is found that strips of wood, painted with different colors, with these different combinations, on being exposed to the weather for several months, and carefully watched, showed different results; that certain colors changed more than others; and we concluded that the deterioration was perhaps due to the fact that the acid had not been properly washed out of the lead in the process of manufacture; the pigment with which you mix your paints is a very important factor, and if a chemist would give you the facts as to what colors are most desirable for use, it would be of great service to the painters and to the roads.

Mr. Brown, of the Old Colony, considered it highly important that the first painting of a car should be properly done. His experience told him that cars cheaply painted proved more expensive in the end than those that were well done at first. Hurrying the work was very detrimental. It is important to get the varnish thoroughly dry before it is exposed to the weather.

Mr. Hibbard, of the Boston & Albany, said that want of uniformity in the material supplied gave the foreman car painter a great deal to contend with.

Mr. Worall, of the Boston & Maine, spoke of the improved results that come from varnish being well rubbed in.

Mr. Nelson, of the New York, Providence & Boston, pinned his faith to pure lead and oil. Had no use for barytes, zinc or any other adulterating substance.

There was a long discussion which was participated in by Messrs. Marden, Walton, Curtis, Jewett, Harden, Adams, Fetting, Couglan and Lang.

Acceptable Defects of Vertical Plane Couplers.

The Central Railroad Club has come to a different decision about damaged vertical plane couplers from that reached by the New England Club. At the last meeting a vote was carried, recommending that cars with vertical plane couplers be received in interchange with the following defects:

Limits of breakage top and bottom of the horn 1½ inches vertically down or up and 2½ inches horizontally, from the outer edge of the guard, provided that 5 inches of metal remain. A breakage of 2½ inches on the vertical line and horizontally, provided that both top and bottom corners are perfect.

Three inches on a vertical line and 1½ inches horizontally in the back of the drawbar.

Fracture front wall of drawbar proper 3 inches horizontally and ¾ inches vertically, as shown in the top, bottom and throat of rib.

Of the extending lug of the vertical plane drawbar, of which the knuckle is pivoted, a chip of half inch vertically and three-quarter inch and three inches transversely. The knuckles must not be broken or chipped in any manner.

In the Gould coupler, where the rib in front of the locking-dog is bent inward so as to prevent the dog dropping, except, if the rib is chipped off so as to allow the dog to drop into position.

Very Cold Feed Water.

A paragraph taken from an English technical journal has been going the rounds of the mechanical papers to the effect that the consumption of coal by a locomotive when the temperature is from 8 degrees to 10 degrees below zero has been found to be increased by from 30 to 40 per cent. above the normal, owing to the greater quantity of heat required to vaporize the water. In Belgium the state railways use 750,000 tons of coal per annum, or about 2,500 tons daily; but in cold and frosty weather the consumption increases to 3,500 tons per day. In addition to this, the consumption of coal on frosty days on the Grand Central, the Nord-Belge and the narrow-gauge railway augments by about 1,000 tons, or a total daily increased of 2,000 tons.

If this statement is correct they must have a different kind of water over there from what we use under the stars and stripes. We cannot make our water colder than 32 degrees Fahr. If we call 60 degrees the normal temperature of feed water we cannot get it cold enough to require more than 28 degrees of heat to bring it up to the ordinary temperature. To raise one pound of water from 32 degrees to the temperature required for steam of 140 pounds gauge pressure 1,192 heat-units must be expended. About 28 heat-units of this will be saved in summer, when the feed water is at about 60 degrees. This would cut a very small figure in coal consumption. Belgian feed water must go down about 500 degrees below zero in winter.

A Molding Machine.

Very few railroad mechanics know anything about molding machines, yet this kind of machine is making rapid progress into use in foundries where many articles of a simple form have to be cast. There are various forms of molding machines in use, but the apparatus is still in a stage of development. We lately watched the operation of a molding machine at Elizabethport, however, that seems to leave little room for improvement if simplicity of form and quickness and accuracy of action are the requirements of a perfect machine of this kind. The machine referred to is the invention of Mr. Harris Tabor, inventor of the well-known steam engine indicator. The principal part of the machine is a steam cylinder with a few simple attachments for holding the flask and controlling the pressure. The cylinder is single acting and delivers the ramming pressure on the top, there being no stuffing boxes or sources of leakage to care for. The pattern is drawn automatically, leaving the operator only the work of lifting the flask and shoveling the sand. The machine takes very little floor space, a machine for 16 × 18-inch flask needing only 26 × 32 inches, no more than a bench molder requires.

The machine was molding brake shoes when we were in the shop. On timing one operation we found that a perfect half mold was made, the flask taken off and placed bottom side up on the floor for inspection in 10 seconds after the sand was put in the flask. A valuable peculiarity about the action of the machine is that the upper part where the gases generally pass out are rammed softer than the other parts. There is also an ingenious arrangement which admits a jet of steam to the pattern and keeps it warm. The machine is particularly well adapted for use in foundries where railroad work is done. Its use will greatly increase the capacity of a foundry and be of invaluable service in the fluctuating rushes for castings that railroad shops are peculiarly subject to. Where it can be used to advantage the machine would pay for itself every three months, besides preventing many vexatious delays.

Moving Trains Through a Flood.

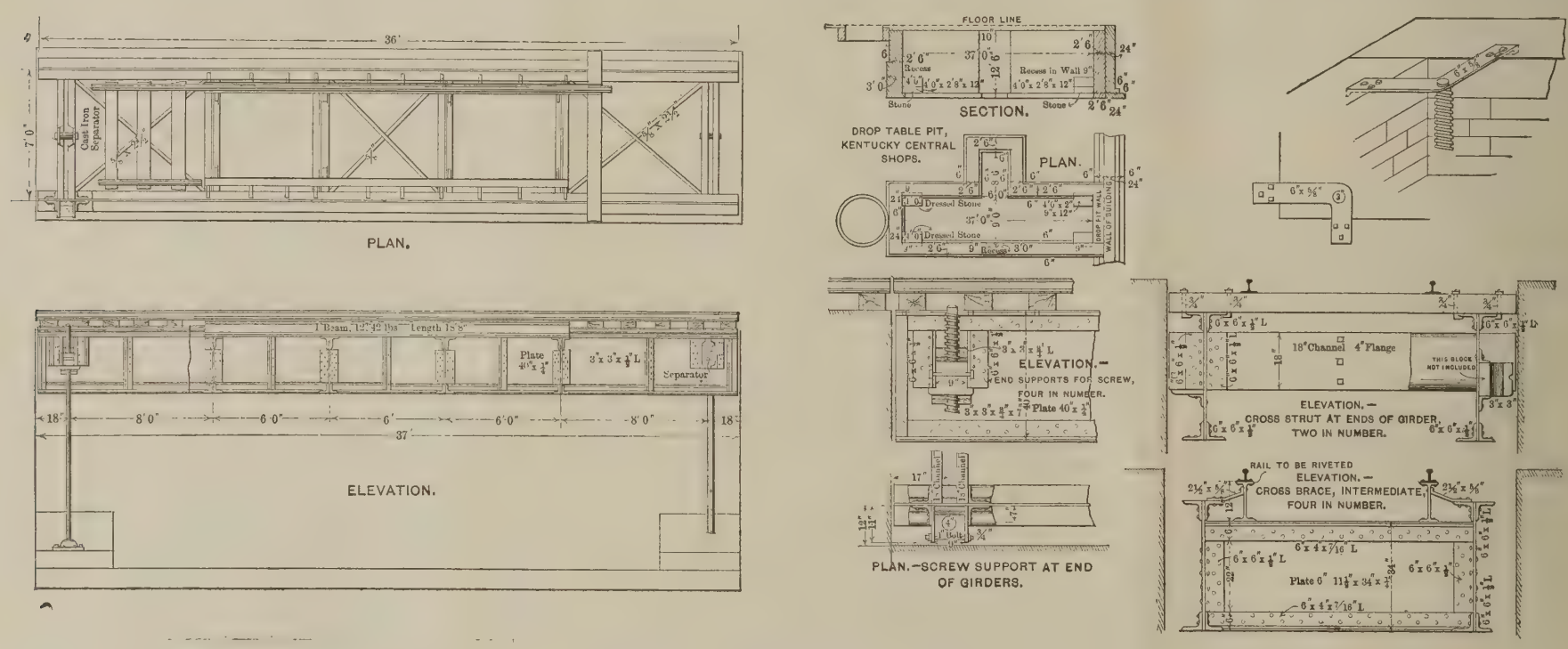
The most remarkable feat in the history of railroading in floods was accomplished on the Pittsburgh & Lake Erie Railroad yesterday morning. It has never been equaled before, and may not be duplicated again for years. Train No. 4, the through express, due in Pittsburgh at 7:40 yesterday morning, was rushed through six feet of water, and the passengers by placing their thumbs on the outer sills of the car windows were able to reach the water with the ends of their fingers. The surface of the water was within three inches of the car windows.

The train was late, and when it reached Chartiers, four miles west of Pittsburgh, yesterday morning, there were four locomotives, fitted with tight fire boxes, ready to bring it to Pittsburgh. The doors of the coaches were made water-tight by the use of oakum, and the fires in the car stoves were put out. A passenger coach will float off its trucks if not secured, and to prevent this two of the locomotives were coupled to the rear of the train. Steam was up in the boilers, and the gauge indicated 140 pounds in each cab when the signal to start was given. The passengers were warned of what was coming, and the train was run at a very low rate of speed until the deep water was reached. Master Mechanic Turner was in the cab of the first locomotive, and at a signal from him each engineer, in both the front and rear, pulled the throttle wide open and they all rushed into the muddy water. When they reached the South Side station only a few inches of water was on the floor of the cars, but the passengers were compelled to stand on the seats. When the locomotive arrived in Pittsburgh it was found that only 70 pounds of steam was in the boilers. Later in the day the Pittsburgh & Lake Erie officials made arrangements with the Panhandle to run trains from Chartiers to Pittsburgh and from Homestead to Pittsburgh to connect with the Pittsburgh & Lake Erie and the Pittsburgh, McKeesport & Youghiogheny trains and bring their passengers to Pittsburg.—*Pittsburgh Dispatch.*

The Baldwin Locomotive Works have just completed four locomotives which are believed to be the heaviest ever built. They are for the St. Clair Tunnel Company, and will be used in the tunnel under the St. Clair River.

Kentucky Central Drop Table.

The annexed engravings show the design of a particularly good and convenient drop table constructed in the new shops of the Kentucky Central at Covington, Ky. These shops were built within the last year, and they embrace what Mr. S. R. Tuggle, master mechanic of the road, considers the most improved appliances for handling repair work of locomotives. Writing us regarding this drop table, Mr. Tuggle says: The drop table is built very substantially of two-plate girders connected across in a rigid manner, especially at the ends where the nuts are held in which the screws work. The nuts are held loosely, so that in case there is any deflection of the table the nuts can shift to accommodate it and not bind the screws. The gearing is all cast and 1½ pitch. We take the power from the main line shaft over a three-pulley counter shaft with one open and one cross belt. The vertical belt from counter shaft to bottom of pit is rubber, on account of the dampness of the pit. To remove the wheels from an engine we run the engine across the table so that the truck stands on solid track beyond the table pit. Engine is disconnected and ash-pan taken off and some short lengths of rail put across the table pit and blocked up against the mud ring of engine. The table is then lowered until the wheels will pass out, which takes about 14 or 15 minutes for a five-foot wheel. The wheels are rolled to the back end of the table, which is long enough for them to stand on it and clear the engine as the table is raised. By referring to shop drawing, you will note that there is an eight-foot turn table at the head of the drop table. The wheels are rolled from the drop table onto this and turned, and then rolled direct to wheel lathe, at which point is another turn table directly in front of the lathe, so there is very little unnecessary handling of the wheels to get from the engine into the lathe. We put a truck under back of the engine from which the wheels have been taken, run her out onto the transfer table and return to the shop on one of the pit tracks and leave the table always clear. We use the table often in unloading heavy castings. such as cylinders, and driving wheels, by lowering the car to be unloaded down to floor level.


PLAN.
ELEVATION.
SECTION.
PLAN.
DROP TABLE PIT, KENTUCKY CENTRAL SHOPS.
ELEVATION.—END SUPPORTS FOR SCREW, FOUR IN NUMBER.
ELEVATION.—CROSS STRUT AT ENDS OF GIRDER, TWO IN NUMBER.
PLAN.—SCREW SUPPORT AT END OF GIRDERS.
ELEVATION.—CROSS BRACE, INTERMEDIATE, FOUR IN NUMBER.

KENTUCKY CENTRAL DROP TABLE.

Peter Cooper Invented Our Locomotive.

American railroad men are not, as a rule, well informed of the important work which Peter Cooper, the founder of the Cooper Institute, of New York, performed for the railroads of this country when they were struggling into existence. Every well-informed schoolboy believes that the locomotive engine was invented by George Stephenson, which is by no means true; but very few of them know anything of what was done by Peter Cooper to demonstrate that locomotive engines could operate the crooked railroads first built on this continent. The story has lately received revived interest by the 100 anniversary of Mr. Cooper's birth, which was celebrated last month.

It is only eight years since Peter Cooper died, but it is 100 years since he was born. During his boyhood and early manhood there were many burning questions up for settlement before the people of the young republic, but no question interested the whole of the population so directly as those connected with improving the means of transportation. The invention of the steamboat immensely widened the territory suitable for settlement, but the lakes and navigable rivers reached only a limited part of the country, and left immense regions that must remain unpeopled unless vastly improved means of land transport could be developed. All friends of progress and of civilization were looking toward steam as the greater Moses.

During the first quarter of this century there was great agitation in favor of applying steam to land transportation. Little beyond talk was accomplished till about 1830. In 1827 the Baltimore & Ohio Railroad was chartered. It was difficult raising money to carry on these new enterprises, and the work proceeded slowly; but by the summer of 1829 26 miles had been completed extending from Baltimore westward. The character of the country traversed entailed the use of a number of sharp curves, and doubts arose as to the practicability of any form of locomotive engine operating round curves of short radius. The uncertainty became so great that capitalists refused to advance more money for the work, and some of those who had taken stock in the company were anxious to sell out. The success or failure of this pioneer railroad was to exert the very greatest influence on those who were urging the construction of railroads in other parts of the country.

Peter Cooper had abiding faith in the use of steam for locomotive purposes, and he built, early in 1829, a small engine to show that the curves could be passed without difficulty. This locomotive was a very small machine, not much bigger than a modern hand car, but it demonstrated the mechanical principle it was built for and stimulated the feeble fortunes of railroad enterprise. The engine was built before the English trials which made Stephenson's Rocket famous, and Cooper had little beyond his own mechanical ability to guide him in the designing of the machine. The locomotive, although capable of developing only about one and a half horse power had all the elements of the modern locomotive. It was the first locomotive to pull a train on an American railroad. The experiments conducted with locomotives on the Liverpool & Manchester two or three months after Cooper's engine was first tried gave confidence to capitalists in the future of railroads, and gave a great impetus to railroad building; but the English experiments were not necessary to direct American engineers as to how successful locomotives could be built. Cooper's engine was the prototype of the American locomotive.

Compound Locomotives on the East Tennessee, Virginia & Georgia Railroad.

The compound locomotives on the East Tennessee, Virginia & Georgia Railroad are giving very satisfactory service, and have long ago taken their place among the other engines of the road, receiving no more attention than the simple engines and taking their turn at all classes of work. The results which they now give in the way of fuel consumption are therefore fully as interesting as the data which might be obtained from a series of carefully conducted tests, for they would show about what may be expected in actual service covering long periods of time. The consolidation compound on that road is competing with simple engines, of exactly the same dimensions, except the cylinders, and the record for December, 1890, stood as follows; The car mileage of the compound was 50,368, and that of three simple engines was 170,725. The coal burned by the former was 171 tons, and the latter consumed 715 tons, making 6.79 lbs. of coal per car mile for the compound, and 8.39 lbs., as an average for the three simple engines. This is a saving of 1.6 lbs. per car mile, or 19 per cent., effected by the compound.

During the same month the compound ten-wheeled passenger engine made the following record as compared with three simple ten-wheeled engines of the same dimensions: The compound made a car mileage of 82,133 miles, and the three simple engines made 81,868 miles; the coal consumed by the compound was 140 tons, and the others burned 519 tons. In other words, the compound locomotive used 8.71 lbs. of coal per car-mile, while the others burned 12.67 lbs. The compound therefore saved 3.96 lbs. of coal per car mile, or 31.2 per cent. of that consumed by the simple engines. Mr. W. H. Thomas, superintendent of motive power, in writing to us in regard to the engines, states that the conditions under which those above referred to were operated were about as uniform as could be obtained in regular every-day service, with the one exception that in the case of the compound consolidation engine the dry pipes were leaking for the greater part of the month. The figures which we have given are the results of every-day work, and were not obtained from any special experiments.—*Railway Review.*

New Long Island Locomotives.

The Long Island Railroad have lately ordered some new locomotives of their eight-wheel standard. The most of the work done by the locomotives of this company is the pulling of light passenger trains, a great part of the line being of a semi-suburban character. Many of the trains are run at a very high rate of speed. As the freight consists, to a great extent, of fruit, market produce and supplies for the fish market, they have to be run light and fast also. The standard engine is designed to handle any kind of the variety of trains run on the road. It is an eight-wheel engine; with cylinders 17 × 24 inches and driving wheels with centers 67 inches diameter. The boiler is 51 inches diameter at the smallest ring and tapers to 53 inches at the course nearest the wagon top. It is usual to burn soft coal in winter and hard coal in summer, so the fire-box is made 10 feet long to give the necessary grate area for the slower-burning coal. When soft coal is burned dead plates are put in the front of the grates, making that part of the fire-box act as a combustion chamber. The fire-box is said to work very well in this way. A peculiarity about the engines is that a long hood projects from the back of the cab toward the tender to shelter the firemen from the weather. The fire-box is well dipped in front and a depression is made in the frames to let the fire-box down as far as possible.

The engines have the American brake with the shoes in front of the wheels. Luttgen's damper is used in the base of the stack and is highly spoken of by the men in charge of the engines. The lubrication of the side rod bearings is done in a peculiar fashion. A hole is bored in the center of the crank pin to hold a lubricating candle. Small holes are drilled through the pin to the bearing and the grease works through these. The plan is reported to work well.

The Illinois Central are preparing plans for the erection of new car and locomotive repair shops to be erected near Chicago and do the work now performed in the ancient buildings at Chicago. They also intend immediately to rebuild the shops at Water Valley, Miss., recently burned down.

The government officials who manage the railways in New South Wales appear to be a little exacting with the "servants" who are under their control. Our railroad men rather resent the claims that some managers make that they have a right to prohibit the employés of a railroad company from drinking when off duty, but the New South Wales "Commissioners" go a good deal further. They have recently issued an order prohibiting the employés from smoking even when off duty.

Boston & Albany Railway Standard Passenger Car.

The accompanying engraving and the supplement page show the latest style of passenger coach used by the Boston & Albany Railroad, and built according to the designs and embracing the constructive ideas of Mr. F. D. Adams, general master car builder for the company.

PRINCIPAL DIMENSIONS.

Length over end sills	58 ft. 6 in.
Width over side sills	9 ft. 6 in.
Height from the top of rail to the top of ventilators	13 ft. 10½ in.
Height of posts between shoulders	6 ft. 8⅝ in.

FLOOR FRAMES.

The side sills of 5¼ × 7½ feet yellow pine and the four middle sills 4 × 6½ feet, also of yellow pine, are framed to the end sills of 6¾ × 7½ feet white oak with double tenons in the usual manner. The top edges of the middle sills are placed one inch below the top edges of the side and end sills, and these are rabbeted on the upper and inner corner to a depth of one inch to receive the under or first floor. This under floor, of one inch matched white pine, is laid across and nailed to all the longitudinal sills excepting where, as shown in the plan, the 14 pieces of 1⅜ × 4 feet hard wood are placed, and which serve as nailing supports to the upper floor. This latter is worked from 1 inch × 3 inches quarter sawed yellow pine strips, and is applied longitudinally. Two and a quarter inches below the top edge of the middle sills is an intermediate floor of ⅞-inch matched white pine; this consists of short pieces cut in between the sills, and rests on cleats nailed to the sides of the sills. The space between the intermediate and under floor is packed with mineral wool. The under side of the floor frame is sheathed with ⅞-inch matched white pine, applied as the under floor.

The end sills are secured in addition to the usual fastenings by rods which extend through cross pieces framed in between the longitudinal timbers, as shown.

The body bolsters are of iron and of the double variety; the compression bars are ⅞-inch × 4 inches, and the tension bars ⅝-inch × 4 inches; the construction is made with I beams.

There are two needle beams of 3 inches × 10 inches, oak, set on edge, and in addition two cross ties of 2½ inches × 7 inches, oak, applied at points between the bolsters and needle beams. Above the needle beams are 2 inches × 6 inches distance pieces and at the sides of these ⅝-inch tie rods.

There are two body truss rods of 1⅛-inch iron enlarged at the ends to 1¼ inches; they are located between the outside and intermediate sills and pass through the end sills. The truss rod posts are of 1¼-inch wrought iron, and are fitted with a vent so that the rods can be strained by these as well as by the turnbuckles.

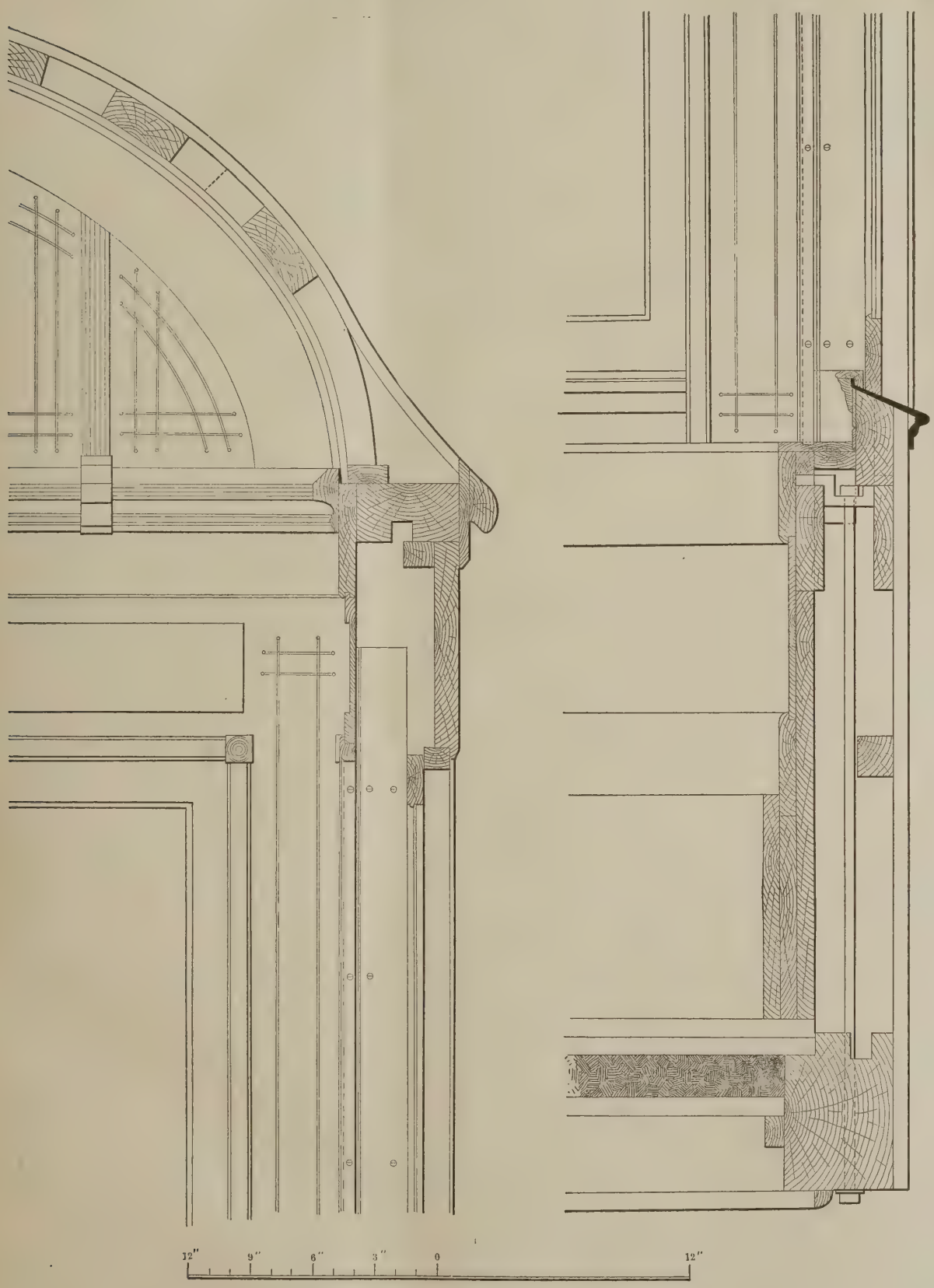
The platforms and steps are constructed as is usual when Miller hooks are employed.

SUPERSTRUCTURE.

The side plates are of 2¾ inches × 5 inches yellow pine laid flat; they are not mortised to let the window-sashes pass through, and these can therefore be raised a limited amount only. The end plates are of 2¾ inches × 14½ inch ash and are framed in between the side plates.

All the posts are of ash, the corner and door posts being worked to a radius of 5 inches and 4½ inches respectively; the intermediate side and end posts are 1¼ inches × 3¾ inches, and all are framed in the usual manner. The vertical tie rods at the sides are ½ inch, and are placed at every second window; the end rods are ⅝ inch.

The side trusses are of ⅞ inch × 5 inches ash, and are double; that is, there is a truss on the inside of the frame as well as on the outside. The truss on the outside is let in flush, but that on the inside projects the full thickness of the braces. As an additional stiffening, the space between the inner belt rail and floor, excepting that occupied by the braces, is lined with matched pine boards. It will be noticed that the truss plank and flat truss rod usually employed to help sustain the ends of the car are omitted.



The belt rails, nailing strips, window caps, etc., are also of ash.

The carlines are of straight grained ash, made of three ⅛ inch × 1 inch pieces, which are steamed and glued up on a form corresponding with the required shape and are clinch-nailed every six or eight inches. The foot of the carline is made separate and of hard pine; it is secured to the carline with glue and screws. There are nine iron carlines ⅛ inch × 1⅜ inches these are placed between a pair of wooden carlines and fastened to these with bolts.

The roof boards, which are ⅞ inch narrow white pine, are secured to the carlines with wire nails. One thickness of building paper is placed between the roof boards and roofing material, which is tin. A number of furring blocks and strips of pine are cut in between the carlines so as to properly attach the head lining, lamps and ventilators.

The platform roofs are constructed with ash arms and end carlines, cast iron corners and pine rafters; the sheathing is of ⅛-inch pine.

The exterior is covered with ¾-inch matched and beaded narrow white wood strips. The ⅞-inch letter board, the ⅛-inch fascia and corner post battens are also of white wood; the corner and door posts and the window battens, which are ¼ × 1¼ inch, are of ash, and the crown molding is of pine; the window sills are of cast iron.

The interior finish, including the headlining, is of Mexican or St. Jago mahogany, and is not very elaborate. The trimmings are of polished bronze and of a plain pattern. When the cars are not equipped with electric lights, oil-burning side lamps are used. The basket racks are about 8 feet 6 inches long, and extend across three windows. There are curtains at the windows instead of the usual blinds. These are of the regular double-faced material, have leather or fringe on the lower edge and are mounted on Hartshorn spring rollers. The seat ends are Henry's iron pattern, No. 151, and the seats have his combined steel plates and spiral springs. Both seats and backs are covered with a good quality of plush, of a golden brown shade.

The cars are warmed by steam obtained from the engine, the Martin system as arranged by the Boston & Albany Railroad Company being employed for the purpose. Ventilation is provided for by placing 30 globe ventilators in the roof.

The trucks are of the ordinary four-wheel pattern, have 42-inch steel-tired wheels and Ross brake shoes.

The car is equipped with improved automatic air brake.

Slow Anti-Railroad Days.

Speaking at the anniversary meeting of the New York Railroad Men's Society about the stimulating effect on the community exerted by railroads, Mr. Depew said: I don't like a man who stands still. I was brought up in a community where things stood still. It was the proper thing to stand still; it was undignified to move, and it was not good form. The horse which I first drove when I used to go around the country when I commenced to practice law before the justices' courts was named Beeswax, because he clung to the ground.

I remember while I was a student at Yale, when I was at home during vacation, I would go up to the drug store, which was the center of the intelligent circulation of the town, and listen to the oracle of the village, as he sat in the chair beside the stove. He thought he was a constitutional lawyer. He was constantly debating with the people who came in whether the powers of the Constitution permitted the Federal Government to exercise certain authority over the State. I said to him once—we all called each other by our first names up there—said I: "John, such a provision of the Constitution gives that power to the government." He said: "When I get home to-night I will read that provision." Ten years after, I was in that drug store, and the oracle sat in the chair alongside of that stove. As I went in, he was discussing the power of the general government of the States. Said I: "John, I think I have remarked to you in a recent conversation that there is a direct provision of the Constitution giving that power to the general government." "Well," he said, "I haven't had time since I saw you last to look it up."

A few years ago there was considerable agitation in favor of adopting the 24-hour notation for this continent, but for some reason the interest in the subject has subsided and the reform movement has been apparently side tracked. We think this is much to be regretted, for the change to the continuous numbering of the hours for the whole day and night is particularly desirable for railroad men, and would prevent no end of confusion and many accidents. The Canadian Pacific has used the 24-hour notation everywhere west of Port Arthur, Ont., for several years, and all concerned are said to like the arrangement. Railroad companies are in a good position to carry out this reform and they ought to adopt the system. We learn from *Indian Engineering* that the railways in India have adopted the 24-hour notation and that clocks are being supplied to the offices of state railways which show only a minute hand. The minutes appear on the circle usually occupied by the hours, and the hour appears through a slot in the dial.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

THE COMING PASSENGER TRAIN LOCOMOTIVE.

A lecture was delivered at the Franklin Institute by Mr. Wm. Barnet Le Van on the kind of locomotive necessary to run light passenger trains from New York to Philadelphia in ninety minutes, the distance being ninety miles. Mr. Le Van is not a railroad man and never has had anything to do with the designing of locomotives, but he has been for a long time an industrious student of matters connected with railroad motive power, and he appears to be considered in Philadelphia an authority on the subject. The question of running fast trains has presented itself to Mr. Le Van in a one-sided and rather impracticable fashion. When it is considered by railroad men of business instincts, they calculate on how many dollars' worth of ticket-holders can be carried on a train run at a certain speed. The money-making part of the problem is ignored by Mr. Le Van; all that he cares to consider is the running of a nominal train ninety miles in ninety minutes. He has read about locomotives used in England with huge single drivers, and an engine of that sort he considers to be the right sort of a machine to keep up a running speed of a mile a minute. His imagination has also discovered that great saving of fuel would result from the use of a locomotive with single drivers. He says that in England, locomotives with coupled drivers burn ten per cent. more fuel than those that have single drivers, and he fancies that by adopting the English type of engine the Pennsylvania Railroad could reduce the consumption of fuel in runs between New York and Philadelphia from fifty pounds per train mile to thirty pounds per mile.

Railroad managers, superintendents of motive power and others are, no doubt, duly grateful to Mr. Le Van and other amateurs for attempted information about the kind of locomotive necessary for the running of unusually fast trains. The condition under which railroad trains are operated will, however, prevent them from imitating English practice. If the ninety miles' run from Jersey City to Philadelphia could be made without the engineer being required to shut off steam more than once, the fundamental condition on which British fast train operating is based would be paralleled, and a large wheeled locomotive with limited adhesion would be in her proper element. As the existing conditions require the steam to be shut off and speed reduced ten or twelve times, the designer of locomotives provide the kind of engines adapted for lifting the train quickly into speed, and nothing else will do.

The existing tendency is toward accelerated express train speeds, and it is likely that by the time the World's Fair opens in Chicago trains will be running between New York and Chicago in 20 hours—an average speed of 48 miles an hour—which would call for a running speed of at least a mile a minute. The railroad men who have to provide the locomotives to run these trains are not liable to appeal to amateurs to help them to design the engines. They would no doubt prefer to use locomotives with single drivers, because the side rod is a weak link in the chain of mechanism at high speeds. This, however, is the principal drawback to a coupled engine. The claim that 10 per cent. of fuel is absorbed by the side rods is the conclusion of hyperbolic prejudice. When all railroad crossings are abolished, and tracks in towns and villages so protected that reduction of speed will not be necessary oftener than once in 50 miles, express trains might be run by locomotives having one pair of driving wheels, if railroad managers found that it would pay to run particularly light trains. This, however, is not likely. The demand of the time is to move weight over distance at the least possible cost to it on slow freight or fast passenger trains. There are hundreds of locomotives in service of about 40 tons weight capable of hauling a train of 100 tons at the average running rate of 60 miles an hour. But that is not the kind of fast train that our railroad managers want. They are required to make money for the companies employing them, and they realize that it pays much better to use locomotives weighing sixty tons that are capable of hauling a fast train of 300 tons. It is a curious study and one that is interesting to some minds to investigate the rapid speed that might be made with safety with locomotives having abnormally large drivers, but as far as the bearing on American railroad operating is concerned, it is just as practicable as speculations or calculations respecting the time it would take a balloon of certain proportions to reach the moon. Locomotives with a single pair of driving wheels had their day on our railroads, and when business increased the four-wheel connected engine took possession of the field. This type of locomotive held its own so long that it became known as the "American locomotive." That kind of engine did admirable service; but the indications are that its days as the motive power for fast passenger trains are nearly over. Running two trains where one will suffice is not good railroading, and trains are becoming so heavy that two pairs of drivers and a four-wheel truck will not carry the weight of the boilers and cylinders necessary to provide the required power. The mogul and the ten-wheel locomotive are slowly taking the place they will eventually monopolize. To talk of employing single driver locomotives at this day is trifling with a serious subject.

CAST IRON KNUCKLES.

When the subject of car couplers was under discussion at the New England Railroad Club, a speaker mentioned a case where cast iron knuckles had been used to repair some verticle plane couplers, and the fact that the knuckles broke before the cars got out of the yard was enjoyed as a funny incident; but it did not appear to strike any one that there was an exceedingly serious side to the case. There was not any superfluous affection manifested for the vertical plane type of coupler by the speakers at the New England Railroad Club, but we feel assured that all of them are anxious that the coupler should receive fair treatment in its struggle for existence. As the knuckle is a vital part of the coupler and the part that receives the most destructive shocks it ought to be made of the very best material. To put inferior material in the knuckles of a hook-coupler is like setting a column on a foundation of mud, certain to bring about destruction. The question arises how many cast iron knuckles have been used in repairing breakages? A question no less interesting to those who are desirous of seeing the coupler get fair play is, how is the practice of using cast iron for knuckles to be prevented?

Some persons might say that no railroad company or man in charge of rolling stock would be so dishonest as to use cast iron for knuckles unless for an emergency. We should like very much to feel that way, but the records of disputes referred to the Arbitration Committee for settlement, convince us that no kind of meanness can be too contemptible for some roads and some men to participate in their dealings with other railroad companies. Men who would scorn to do an action in regard to their own private business that tasted of dishonesty, seem to lose conscience when they are acting for their employers and trying to get the best of their competitors. For this reason it is necessary that rules should be formed and a system of marks instituted which will prevent the use of cast iron for knuckles. The leading master car builders interested in the protection of their companies ought to require makers of vertical plane couplers to put registered marks on the knuckles they manufacture and car inspectors should be instructed to refuse cars with knuckles that are not marked with this guarantee that the proper material has been used. No other effectual means of distinguishing the good from the bad, the right from the wrong, is practicable. It requires an expert to distinguish malleable castings from close-grained ordinary cast iron before the knuckles are painted; after they are painted no one can tell with certainty what the material is.

This subject ought to receive the earnest attention of the master car builders at next convention, and in the meantime we would suggest that it be taken up by the railroad clubs, and the views of members obtained as to how the necessary remedy could be best enforced. Some thing certainly ought to be done, and done without any unavoidable delay.

UNEVEN WEAR OF LOCOMOTIVES TIRES.

The proceedings of railroad clubs are now so voluminous that we seldom find space for more than a synopsis of the papers, but we make an exception this month, and publish in full the text and illustrations of a paper read by Mr. J. N. Barr, superintendent of motive power of the Chicago, Milwaukee & St. Paul, at the Western Railway Club, on "Irregular Wear of Locomotive Tires." We consider the paper the most valuable contribution to the literature bearing on locomotive operating which has been published for several years, and we heartily commend our readers interested in locomotive matters to study the paper carefully, for it will well repay the labor. Men in charge of locomotives have their attention constantly attracted to the fact that the tires of locomotives do not wear evenly. There are portions of the tread that wear more rapidly than others. Observant men have noticed that the irregular wear takes place on portions of the tire that have a constant relation in position to the crank pins and the counterbalance weights. This has led to vague speculations about the imperceptible slip of driving wheels. Although a great deal has been written about this subject, and many extravagant statements have been made about the magnitude of this imperceptible slip, there has been no real information obtained about it, and many mechanical engineers have come to regard it as a myth invented and circulated by parties who were interested in deceiving people about the real cause of irregular wear of tires. The real cause they allege to be inferior material.

The labors of Mr. Barr, as manifested in the paper on irregular wear of tires, have introduced a highly practical turn to the questions under investigation. Instead of illusory speculations based on empirical theories, he has given to the engineering world a logical explanation of the irregular wear of locomotive tires, based on simple calculations of the forces acting on the wheels during the whole of a revolution at a time when a locomotive is performing hard work.

In pursuing the investigation into the cause of the uneven wear of driving wheel tires, experiments were made with a fairly representative eight-wheel locomotive, and the wear of the tires carefully noted. When a certain uneven wear had developed, the tires were turned off and then they were moved round on the wheels to put the places where the wear had been to new positions on the wheels. The engine was again put into service, and the uneven wear developed at the same places as before in relation to crank pins and counterbalance, showing that the wear was due to the irregular measure of the forces acting on the wheels and not to uneven quality of the tires. Calculations were then made of the forces in action on the engine moving at 40 miles an hour, and they demonstrated that at certain points of the revolution the centrifugal forces of the counterbalance weights reduced the downward pressure of the wheels so much that they were close to the point where the rotative effort that produces slipping overcomes the adhesive friction that makes the wheel bite the rail. The variation of total pressure on the rails was as great as ten tons. The calculations also showed that the greatest wear of the tires was coincident with the greatest tendeney of the engine to slip. The computations were made for every ten degrees of the revolution of the driving wheels, beginning with the crank pin at the forward center, the right hand crank leading. Full particulars are given in the table that accompanies the paper. The action of all the forces that have to be considered throughout the whole revolution are also shown graphically in the illustrations with the paper. The conclusions drawn by Mr. Barr from the investigations are:

1. Flat places on driving wheel tires are not entirely due to lack of uniformity in the wearing quality of the same.

2. The flat places have a tendency to group themselves where the coefficient of slip is greatest.

3. They vary in depth with the pressure on the rail, and when the pressure does not exceed 11,000 lbs. the imperceptible slip produces but little abrasion.

4. Imperceptibe slip does not appear at random on any part of the wheel, but in special localities as fixed by the maximum values of the coefficient of slip.

5. The counterbalance should be as light as possible compared with the reciprocating parts, consistent with smooth riding.

6. The weight of the reciprocating parts should be as light as possible.

This paper ought to act as an admonition to the locomotive designers and officers in charge of railroad motive power who have departed from calculations in the proportioning of pistons and cross-heads and rods and become converts to the doctrine of hugeness. When the taste for steam-hammer proportions for reciprocating parts was first coming in we were invited to examine one of a group of heavy locomotives for a Western road. We were amazed at the size of the crank-pin connections, and ventured the criticism that the engines would be hard on bridges and rails. Blank rails and bridges, said the man responsible for the proportions, let the engineers make them strong enough. From further talk the impression was gleaned that the designer of the engines did not believe that the weight of the moving parts of locomotives conveyed any uneven pressure upon rails or bridges. The engines referred to are noted for wearing flat spots on their tires. We never heard how they treated rails and bridges, but the engineering depart-

ment of the road no doubt know and entertain sentiments accordingly toward the mechanical department. A locomotive will work after a fashion with tires pretty badly out of round, but the loss of power due to friction makes the engine expensive to operate. A locomotive that tends to wear flat spots on the tires is, therefore, expensive on repairs and inefficient in doing work. To those who wish to prevent this prevailing evil we would say with Mr. Barr, make the reciprocating parts as light as possible so that a light counterbalance may suffice. Make the driving wheels as large as practicable.

INFLUENCE OF THE TRUCK RADIUS BAR.

In our February issue we published an article on the length of the locomotive radius bar, by Mr. L. M. Pomeroy, who is a very industrious and intelligent student of everything connected with locomotive construction. The article was of a very unpretentious character and merely described certain easy methods of determining the proper length of the radius bar of a pony truck, adding some particulars of the dimensions used by leading railroads and locomotive builders and commenting on the operative effect of change in the length of the bar. There was no claim of originality in the article, a plain statement of admitted facts being all that was intended. We have seldom published anything which seemed less likely to arouse criticism or to excite contention. The hypercritical proclivity or the verbiage necessity of the *Railroad Gazette* has, however, made the article a target for nearly two columns of objections. The inclination of our contemporary to pose as the "Constant Objector" has carried it in this instance beyond its usual practice of reckless contradiction. Stated briefly, the *Gazette* says that our correspondent gives impossible functions to the radius bar in saying that it can be so proportioned that it will tend to prevent the cutting of flanges of truck or front driving wheels, that it has no tendency to keep the leading driving wheels from pressing against the outside rail, and that its only function is to maintain the truck axle normal to the curve. Here is a specimen of the quality of argument used :

If a locomotive were pulled around a curve by the engine truck, making the wheels of that truck act as driving wheels, then it would overcome its own resistance and the pulling of the truck on the radius bar pin would tend in a slight degree to haul the front of the locomotive toward the inner rail and assist in guiding the engine; but no such case exists in practice. A little thought will bring out the parallelism between the assumption that a radial truck guides an engine by means of the radius bar or box and the lifting of one's self by one's boot-straps.

According to this reasoning it would be absurd to suppose that a four-wheel truck, or, for instance, the front wheel of a bicycle, would influence those behind in curving since neither of them pulls the wheels that follow. The commonly accepted belief about the design of the pony truck is, that when the radius bar is designed for the exact radial length the wheels will roll unchecked round a curve and be guided by the flange of the outside wheel; when the radius bar is made longer than the normal radius, its action will tend to press the outside wheel toward the curve, and that when the radius bar is shortened from the true radius it will tend to draw the inside wheel toward the rail on a curve, and by the same cramped action tend to draw the front driving wheel away from the outside rail. We never before understood that there was diversity of opinion about this matter, and we believe still that the objection under discussion was raised purposely to find fault with the statement of our correspondent. We will cite two opinions on this question that may be taken as representing the locomotive builders and the railroad master mechanics of the country.

The Baldwin Locomotive Works say : "A pony truck with radius bar performs the best work when it will guide the front of the engine by the side adhesion of the truck wheels (so to speak). This we accomplish by making the radius bar shorter than would be given by using the intersecting point *A* (true radius), as obtained by the formula. We first find the point *A*, and then take a point nearer the track center in order to shorten the radius bar. . . . The effect of this shortening is to throw the truck axle around a little inside of the radial line. . . . The adhesion of the truck wheels slipping sidewise on the rail counterbalances the centrifugal force of the front of the engine, and also relieves the flange of the adjacent driving wheels from guiding on curves."

The mechanical officers of the Chicago, Burlington & Quincy write : "A radius bar of a length determined by the formula (true radius) will place the truck wheels normal to the curve, but it will do little toward guiding the drivers in a curved path, and they will run to the outside rail. . . . If now the length of the bar is shortened (say 9 per cent., as in H and I engines), the wear is distributed between the flanges of truck and drivers. If the bar is made still shorter the truck flanges will wear most, and front drivers less, and by watching wear of flanges one can decide whether the bar is too short or too long."

In an editorial article which was not gotten up for the purpose of contradicting anybody, the *Gazette* recently says: "Some designers prefer to shorten the radius bar and thus cause the outer wheel to lead on a curve. This, if carried to a sufficient degree, will make the flange of the inner wheel crowd against the inner rail instead of the outer wheel flange against the outer rail by reason of the curvatures of the track, as the case would be with the pin in the position given by the formula (true radial position). Two points of advantage are by some supposed to be gained by the shortening of the radius bar. (*a*) A decrease in the flange wear on the truck wheels. (*b*) A decrease of the flange wear of the front flanged drivers."

We regret having to devote so much space to a matter concerning which there is really no diversity of opinion, but we cannot permit a correspondent to be attacked without explaining the merits of the case.

A COMPLEX COMPOUND LOCOMOTIVE.

The growing popularity of compound locomotives is leading to the inventing of a variety of forms and combinations whose principal purpose is to provide strong patent connections. One of the latest patented compound locomotives is the invention of Mr. B. C. Wright of New York, and it is reported that the engine will be given a trial on the Manhattan Elevated Railroad. We have not examined any specimen in the compound locomotive line which we consider less adapted to meet successfully the peculiar conditions of the New York elevated railroads. The greatest possible measure of power for a given restricted weight is essential, owing to the weakness of the structures carrying the track ; the Wright invention is a form of engine that will require a maximum of weight to provide a minimum of power. The engine has four cylinders set side by side, two low-pressure cylinders in the middle and two high-pressure cylinders on the outside To avoid the use of cranked axles, the high-pressure cylinders' cross-heads are connected by levers to the cross-heads of the low-pressure cylinders, one piston pulling the cross-head that transmits the power while the other pushes it. The arrangement is very ingenious, but it entails the employment of a collection of mechanism that no clear-headed master mechanic would venture to introduce on locomotives. There is one good idea in the design of the locomotive. The extension smoke-box is made with an inside and outside shell, and the intervening recess is used for an exhaust steam receiver and superheater.

Those who are devoting their time to the inventing of compound locomotives ought to remember that any arrangement which increases the mechanism of the engine is objectionable, and is certain to militate against the success of the invention. The most successful simple locomotives are those that have the fewest number of working parts. A material increase in the number of parts of a locomotive applied to make the engine work the steam successively through two cylinders is likely to increase the first cost and expense of maintenance sufficiently to overcome any saving that may occur from the enhanced economy in the use of steam.

GRIEVANCES OF PENNSYLVANIA TRAINMEN.

We regret to learn that there is a strong probability of a strike among the trainmen of the Pennsylvania lines west of Pittsburgh. There has been for years a great deal of discontent growing among the trainmen of these lines, originating mostly out of the species of trifling grievances that good management generally remedies without expense to the company or loss of dignity to the officials. There is a decided tendency on all the Pennsylvania lines to impress upon employés the assurance that they are of an inferior breed to the upper ranks of the service, and treatment is accorded on this principle. It does not suit Western ideas and there has always been opposition on the lines west of Pittsburgh to the martinet methods. Railroad men or others cannot well formulate a complaint of supercilious treatment from their officers, but it makes them quick to resent any injustice that can be made tangible, such as a low wages schedule.

The grievances of the trainmen of the Pennsylvania lines west of Pittsburgh have gradually been coming to a head, and a few weeks ago a grievance committee, after a protracted conference, presented to the company a schedule of 168 articles relating to rates of pay, payment of overtime, discipline of employés and adjustment of minor matters. This was offered to the company as a basis of agreement. When railroad companies receive a formulated claim of this sort from their employés, they generally try to effect a settlement by offering to grant the smaller part, and they frequently adjust great differences with very small increase of expense This is not the way of Mr. James McCrea, who represents the companies' side in this dispute. The reply given to the grievance committee was that no concession whatever should be granted. The representatives of the employés were informed that the granting of the claims would increase the pay roll over seventy thousand dollars a month, a sum which if capitalized would be sufficient to double track the Northwest and Southwest systems. Rates are so low and legislatures so unfriendly that the company felt indisposed to increase the operating expenses.

We consider Mr. McCrea a very able man, but it looks as if his well-known obstinacy had placed his company in a position that cannot be maintained with justice. Let us reason together is a very good motto, but he appears to think that for a railroad manager it merely means sitting in state and rendering a decision. The trainmen are liable to retort that they are not consulted in making the unremunerative rates for transportation, and that the aggregated capital represented by the increase of wages asked for is beside the question. They may also be expected to add that they are not unreasonable in asking to be paid the same rates of wages accorded to men doing the same work on neighboring lines; and that a just manager would favor the establishing of rules that would prevent petty officials from trampling upon the men. The unfortunate part of the situation for the company is that should a conflict arise, the sympathies of the public would to a certainty be with the men. Money representing large capitalization of wealth may readily be worse expended than in making the employés of a great railroad system satisfied with their lot.

THE NEW YORK TUNNEL COLLISION.

A fatal rear-end collision happened last month in the tunnel by which the railroads running out of the Grand Central station pass through New York City. The tunnel is operated by the absolute block system, yet a passenger train belonging to the New York, New Haven & Hartford ran into the hind end of a train of cars being hauled to the storage tracks, and six persons were killed. The unfortunate victims of the accident were car cleaners and other employés of the company going to their work. The engineer of the passenger train maintains that the signal which should have kept him from passing upon the block until the other train was off gave a clear signal; the signalman holds that the signal was at danger. When the signal is at danger a large gong at the side of the track is kept ringing, and all the people on the train that caused the accident say they heard no sound, although the gong makes a far-reaching noise. The blame of the accident appears to be between the signalman and the engineer, but there is some suspicion that the system of operation was to blame and the absolute block system was not always strictly observed. Some of the trainmen have informed us that more than one train was sometimes permitted on the block when trains were crowded. If this is true the superintendent in charge of the tunnel is as much to blame for the accident as the engineer and signalman, who were promptly arrested.

When the collision happened the car which was struck took fire and one or more of the victims of the accident were burned to death. From careful inquiries into the origin of the fire we are convinced that it was caused by the headlight of the locomotive. There was a Baker heater in the car smashed, and very fierce attacks were made on the company by the daily papers for clinging to the deadly stove, but there is every reason to believe that in this case the stove was guiltless.

BOOK NOTES.

CONSTRUCTIVE STEAM ENGINEERING, EMBRACING ENGINES, PUMPS AND BOILERS, AND THEIR ACCESSORIES AND APPENDAGES. By Jay M. Wiltham, M. E., C. E. Published by John Wiley & Sons, New York. Price, $12.

This is a book of 900 pages, $6\frac{1}{4} \times 4$ inches. It is very profusely illustrated, and with the exception of locomotives it shows nearly every form of steam engine, pump, and boiler, with their attachments, to be found in use. The work is to some extent a compilation of descriptions of steam machinery, but it has been carefully edited by an engineer of mature experience and good judgment.

The scope of the book is very well explained in the author's preface as follows : "First is given a brief classification of the various types of engines, after which follows a chapter on heat and steam, embracing thermometers and calorimeters. Next the constructive details of an engine are illustrated and discussed, after which the indicator and its uses are presented. Then there is a chapter treating of the use, operation, and setting of the slide-valve and independent cut-offs, using Laner's diagrams for illustration. Next follows a discussion of the various forms of valve-gears and automatic cut-offs and throttling engines. A chapter is now devoted to the compound triple, and quadruple expansion engines, after which condensers, pumps, and pumping engines are considered. Then comes a chapter on the miscellaneous attachments and minor details of an engine, embracing stop, throttle, and relief valves, stuffing boxes, belting, lubricators, etc. Next is given a chapter on the management of engines and pumps, engine trials and dynamometers."

The remainder of the book is devoted to boilers, their appendages and accessories, and the decay and management of the same. Although the author is a university professor the book is written in a simple style that can be understood by the ordinary working engineer. We know of no more convenient book for the use of men who sometimes require to ascertain particulars about the design and construction of the various forms of steam engines and their attachments that are to be found in the various places where steam power is employed.

Personal.

Mr. Elwood S. Scheetz has been appointed master car builder of the Georgia Railroad in place of Mr. T. M. Preval, assigned to other duty.

Mr. T. F. Warwick, for a long time master mechanic of the Central, of Georgia, has resigned to take the management of the Warwick Manufacturing Company, in Augusta, Ga.

Mr. Rollin H. Wilbur, Jr., assistant to the second vice-president of the Lehigh Valley and a son of President Wilbur, has been appointed to a position on the staff of the Governor of Pennsylvania, with the rank of colonel.

Mr. Philip Hoffecker, master mechanic and superintendent of the Lehigh Valley shops at Weatherly, Pa., died at that town last month. Mr. Hoffecker was the father of Mr. W. L. Hoffecker, of the Central of New Jersey, and was one of the oldest master mechanics in railroad service.

Mr. John Harrington, who went from the Southern Pacific to be master mechanic and trainmaster of the Mexican Northern Railway, writes us from Escalon, Mexico, that they are rapidly pushing an extension of the road. Mr. Harrington has been prostrated with fever, but is now better.

Several changes have lately been made among the mechanical officers of the Pittsburgh, Cincinnati & St. Louis. Mr. W. C. Arp has been transferred to Dennison, O., succeeding the late Mr. C. B. Street. Mr. S. S. Stiffey, for several years general foreman of the shops at Dennison, has been appointed master mechanic at Logansport, succeeding Mr. Arp.

At the annual meeting of the Central Railroad Club the following officers were elected for the ensuing year: President, Eugene Chamberlain, New York Central; vice-president, Fred B. Griffith, Delaware, Lackawanna & Western; secretary and treasurer, James Macbeth, West Shore; assistant secretaries, Harry D. Vogt, *Buffalo Courier*; W. E. Corcoran, *Buffalo Express*.

Mr. Benjamin F. Free, one of the oldest and most respected locomotive engineers on the Pennsylvania Railroad, died at Harrisburg, Pa., last month. During the year of the Centennial exhibition at Philadelphia he received a handsome gold watch from the Baldwin Locomotive Works for the long mileage he made with one of their engines between the periods of repairs.

Mr. George Morris, general manager of the French Spring Company, has been for the last month sweating and gasping for a breath of pure ozone in the most fashionable quarter of Barbadoes. As idleness is irksome to George even during a holiday, he is banishing weariness by studying the best methods of sugar raising, with a view of giving them practical application on his five-acre ranch near Pittsburgh.

Capt. Harding, of the Raleigh & Gaston, has now fully recovered from the loss of the 17 engines injured by the burning of his new roundhouse at Raleigh. The average cost per engine for repairs was about $600. A smothered fire in tender filled with wood was the origin of the fire. The roof caught and fell upon the engines and set their loaded wood tenders on fire, and the entire 17 tenders and cars were on fire at one time.

Jacob Myers, one of the oldest engineers in America, died in Saratoga last month, at the age of 72. He began running an engine on the Rensselaer & Saratoga Railroad, now the Delaware & Hudson Railroad, forty-five years ago, and continued uninterruptedly up to last summer. He was known to railroad men all over the country, and was a prominent Knight Templar. He had never had an accident during his long time of service.

Mr. Lyman Gould, president of C. B. Rogers & Co., of Norwich, Conn., died last month, aged 71 years. Mr. Gould was in his youth an expert pattern maker, and in this capacity entered the works of J. A. Fay & Co. early in the fifties. He designed numerous improvements in wood-working machinery. In 1858 he entered the C. B. Rogers employ as a pattern maker, and gradually rose in the firm till he reached the position of president.

Quite a sensation was caused in Paterson, N. J., last month, through the disappearance of Mr. W. W. Evans, superintendent of the Grant Locomotive Works. Those who were best acquainted with Mr. Evans expressed themselves as being confident that he was not lost for good, and events proved that they were right. He returned after a week's absence, and was by no means pleased at the hue and cry raised because he had gone away quietly to enjoy himself.

Mr. H. R. Nickerson, who has been for several months general superintendent of the Eastern lines of the Atchison, Topeka & Santa Fe, has been made general superintendent of all the company's main line. Mr. Nickerson has been on the Atchison, Topeka & Santa Fe for 19 years, having risen through the grades of telegraph operator, station agent, material agent, conductor, train master and superintendent. He is a remarkaly clear-headed operative officer and is very popular with the men under his charge.

Mr. A. F. Redfield, general foreman of the Wisconsin Central Car Shops at Stevens Point, Wis., died on February 5. Mr. Cormack, master car-builder, writing of Mr. Redfield, says: "He commenced work here when sixteen years of age. Having commenced at the foot of the ladder he gradually worked his way up to the position of general foreman of the wood-working department, which position he has held for the past five years. His ability was recognized by all who knew him. He was methodical in his ideas, careful and untiring in his undertakings, and would, without a doubt, have been called to fill a higher position at no distant day in the future. He was a member of the common council of Stevens Point for a number of years and a member of the board of education for the past two and one half years and its treasurer at the time of his death. His good clear judgment was appreciated whether in the shops, council, or school board.

Mr. J. N. McCullogh, first vice-president of the Pennsylvania lines west of Pittsburgh, and a central figure in railroad management for 30 years, died at his residence in Allegheny City last month. He was born at Yellow Creek, Jefferson County, O., in 1821. His earlier years were spent in mercantile pursuits, and in 1858 he entered the railroad field as president of the Cleveland & Pittsburgh Railroad. The following year he was appointed its receiver. Under his management the road was freed from its difficulties, and within five years became a paying property. His ability as a railroad manager was at once recognized, and in the spring of 1863 the Pittsburgh, Fort Wayne & Chicago Railroad Company offered the general superintendency of the Fort Wayne road to him, which he accepted. In 1871 the Pennsylvania road leased the Fort Wayne road, and Mr. McCullogh was made general manager. Later, when the Pennsylvania company was formed, he was chosen first vice-president. His estate is said to be worth more than $10,000,000.

Mr. George Phillips, one of the oldest and most intelligent locomotive engineers of the Maine Central, has been appointed traveling engineer of the road. In making the appointment Mr. Amos Pilsbury, the general master mechanic, says his duties will be to inspect and report the condition of all engines, to examine the methods of firing, and instruct firemen in their duties concerning consumption of coal, oil, waste, etc. He will see that engines and tenders are kept clean, and that tools and small stores are in their proper places. In fact, he will have general supervision while on an engine, and his instructions will be respected and obeyed by engineers and firemen. He is authorized to inspect all engine houses, pump houses, steam pumps and boilers, and require the machinery of same kept in good condition, and the surroundings neat and clean. He will receive his instructions from the general master mechanic, and report all cases of neglect or extravagance to him or the division foreman. Division foremen, foremen of engine houses, engineers, and all concerned are requested to render all the assistance in their power to enable the traveling engineer to carry out his instructions.

Mr. George L. Sands, general superintendent of the Atchison, Topeka & Santa Fe, has resigned, having held the position for four years. Mr. Sands has had a remarkably chequered career even for a Western railroad man. As a start in railroad life he was successively brakeman, conductor and train dispatcher. On another railroad system he went through the grades of laborer, brakeman, conductor, assistant superintendent and superintendent. Two more changes were made, and he worked on two different roads as conductor. Another change and he appears as master of transportation, and subsequently as superintendent. After that he went to Argentine and to Brazil, doing railroad work in both countries. His next experience was in the position of road master of a Texas road. From there he went to the Atchison, Topeka & Santa Fe as brakeman, but soon rose to be conductor, and then to be train master. Another change and we find him resident engineer and division superintendent of the International & Great Northern, which he left shortly afterward to take the position of assistant superintendent on the Texas & Pacific. From there he returned to the Santa Fe, and rose to be general superintendent. He is an able man, but he wants to run every department and every man on the railroad he is connected with. Few railroad officers have succeeded in making themselves so unpopular with the mass of employés under them. There is no doubt that the motives of the Santa Fe engineers in striking during the "Q" trouble were in a great measure actuated by a desire to get even with Mr. Sands. An influential officer who left the Santa Fe road some time ago expressed himself as being gratified that he was in a position to tell Sands what he thought of him, and the thoughts were far from being complimentary. Ability, energy and integrity were the forces that pushed Mr. Sands upward; but in spite of these good characteristics, Mr. Sands is the kind of officer that railroad companies cannot now afford to employ.

Prosperity of a Pioneer Master Mechanic.

Part of what is now the Central Railroad of New Jersey was among the first railroads projected in America, the Elizabeth & Somerville Railroad having been chartered in 1831. It was much easier to project than to obtain the money necessary for building railroads in those days; but as early as 1839 twenty-five miles of the railroad had been completed from Elizabeth to Somerville. The master mechanic of this early railroad was Samuel L. Moore, who had helped to build the first locomotives for the railroad company and then took charge of the machinery. Mr. Moore was the kind of man whom nature had gifted to be a leader in his business. Had he remained a master mechanic he would have become noted as an example for all smaller men of the craft to follow with safety. He did not believe that there was a satisfactory future in railroad business for a pushing man conscious of ability beyond common, and as early as 1855 he abandoned railroad work and started a machine business in Elizabethport, N. J.

Mr. Moore's machine business did not increase very rapidly, but the growth was sure. Besides this business a family of stalwart sons grew up around their father and they all took to the shop as a duck takes to water. In the course of time father and sons joined fortunes together and the firm of S. L. Moore & Sons Co. is now one of the largest and most prosperous engineering concerns in the neighborhood of New York. It promises to rival the past glory of Delamater's, the Morgan Iron Works, and to exceed the present prosperity of the best managed engineering establishment on the Delaware.

During a recent visit to the place we were surprised to find a busy ship-building yard where three or four years ago nothing but fishing skiffs and oyster boats cumbered the ooze fringing the historic Arthur Kull. There we found on the stocks a fine double-decked iron ferryboat for the Pennsylvania Railroad and a variety of other railroad swimming craft, besides a vessel or two for the government. The methods and machinery employed in this yard are very different from those that have been tried in other ship-building yards that languish under the pressure of foreign competition. The most approved methods of shipbuilding followed on the Clyde and Tyne have been improved upon here and American ingenuity has developed labor saving machinery not considered worthy of attention beyond the seas. Besides the ship-building yard there is an extensive machine shop and foundry where steam engines, mining machinery, power molding machines and a great variety of machine shop products are turned out. The S. L. Moore & Sons company are building up a fine business that will be a credit to all concerned and a source of prosperity to the district. We are very much gratified to find that the originator is one of our favorite constituents, a railroad master mechanic. The founder of the company is a hale and heary octogenarian who still takes as much interest in the business as the youngest of his sons.

Railroad Poets.

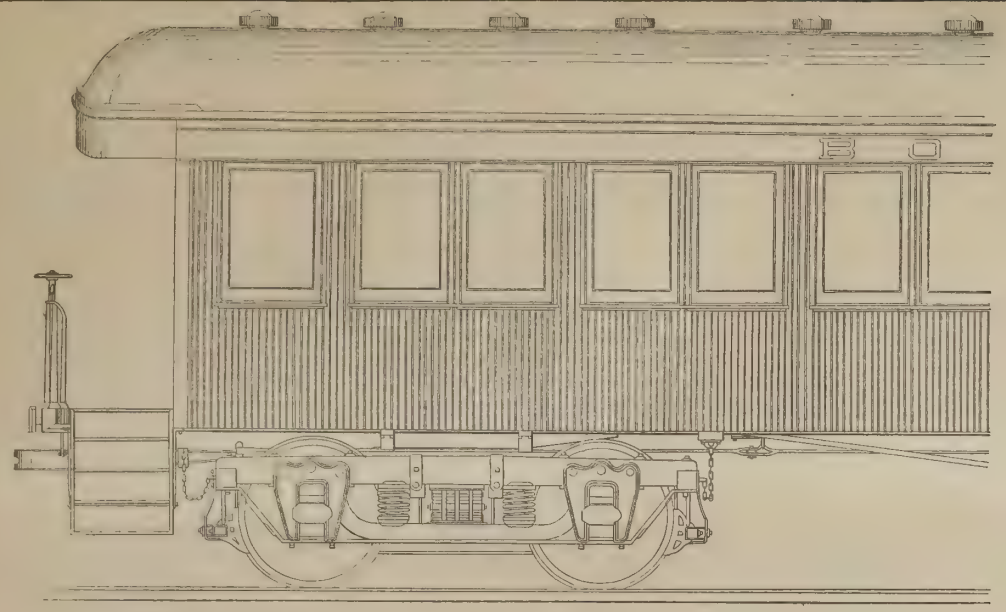
We are every day finding new illustrations of the truth that no surroundings can be prosaic enough to quench the aspirations of hearts made "pregnant with celestial fire." Tapping car wheels and greazing axle boxes appears to be a particularly prosaic occupation, but Adolph Viart, whose life has been passed performing these duties on a French railway, has recently been invested with the silver palms and violet ribbon of the French "Academie" as an acknowledgment of the great merit of his poems. His poems have been published in two volumes. One bears the title of "Dark Hours," the other that of "Lily Dreams."

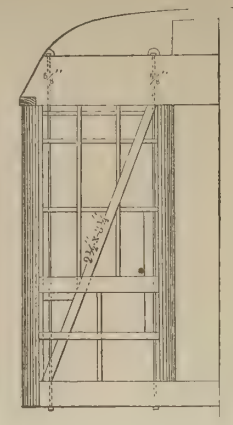
A section hand in Scotland, Alexander Anderson, attracted much attention a few years ago as a poet, and his verses brought for him a comfortable position as librarian of a great public library in Edinburgh.

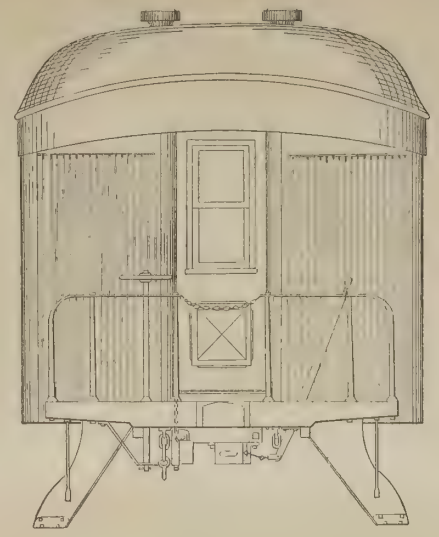
America does not take much note of its railroad poets, but we would be willing to enter Shandy McGuire, Cy Warman and others against any of the wheel tappers or tie tampers in Europe.

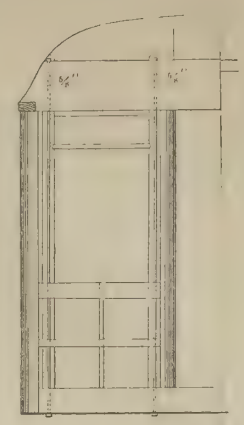
A bill has been introduced in the legislature to incorporate the Alabama Locomotive Company, at Montgomery, Ala., with a capital stock of not less than $1,000,000. It would be a much easier matter to put one million dollars into a plant for locomotive building in Montgomery, Ala., than it would be to earn the interest on the outlay. Good mechanics are too hard to find or to retain in the far South at present for the successful operating of locomotive works that would have to compete with Northern establishments where skilled labor can be got cheap.

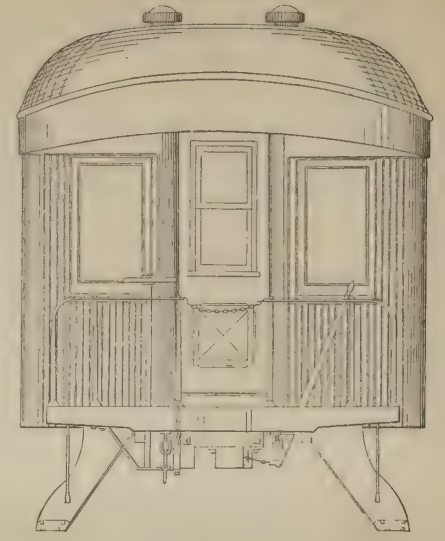
Experiments on the French railways show that the resistance of the atmosphere to the motion of high-speed trains amounts often to half the total resistance. Two engines, of which the resistance was measured separately and found to be 19.8 pounds per ton at 37 miles per hour, were coupled together and again tried. The resistance fell to 14.3 pounds per ton. The second engine was masked by the first. It may be argued from this that by a suitable adaptation of the front of a locomotive, electrical or otherwise, a saving of from 8 to 10 per cent. of the effective power could be made.

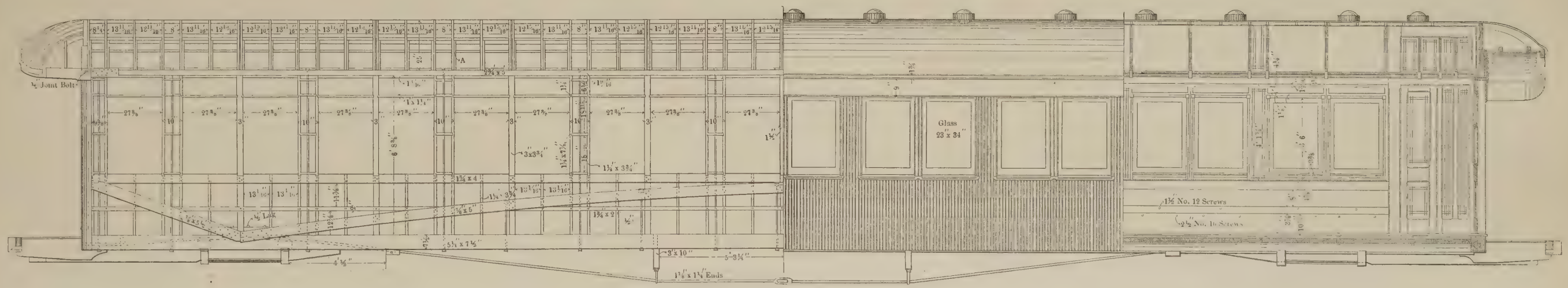


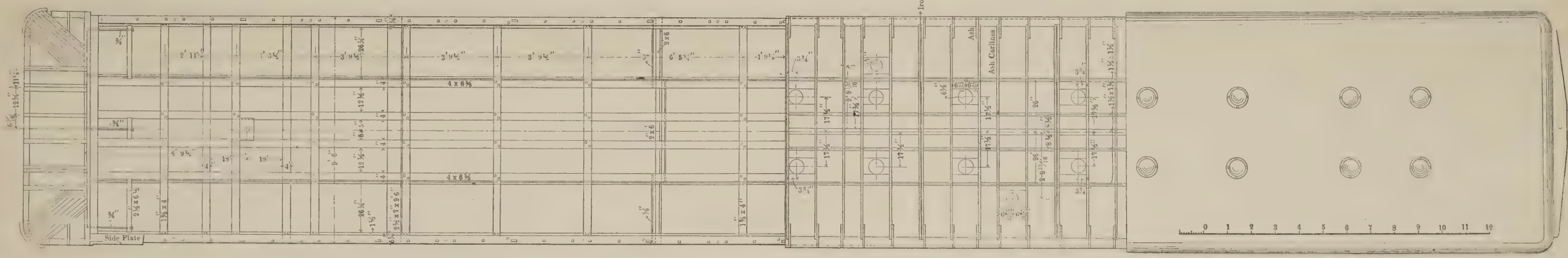












BOSTON & ALBANY RAILROAD PASSENGER CAR.

Communications.

Adjusting Link Motion.

Editor National Car and Locomotive Builder:

There seems to be an element of mystery even at this day in the designing of a link motion that will give approximately equal cut-offs for all grades of expansion, and recourse is had by trial and error to find the position of the center of the supporting link, to equalize as near as possible the cut-off with its resultant, excessive movement and wear of the block in the link when hooked up short.

Now for any link motion, whatever may be the proportions of excentric throw, length of rods and length of link, there is a radius of link for these proportions that will give the best results, and this radius is always less than the distance between the center of the axle and the center of the link.

The method used by the writer for finding this radius is: when the proportions of the valve motion are determined, *i. e.*, throw off eccentrics, lap and lead of valve and length of link, make a drawing of the link motion with the link in mid gear, with crank on forward centre, and then, with the crank on rear center, draw the center lines of the link. In this preliminary drawing the radius of the link is taken from the center of the axle to the center of the link. On comparing the movement of the center of the link and the distance between the eccentrics in fore and aft positions, it will be found that the movement of the center of the link is the greatest, and that this excess of movement is to the rear of the link travel. This excess of link travel over eccentric movement is due wholly to the crossing of the eccentric rods, and this unequal travel is corrected by *adding one half of the difference of the link travel in mid gear and the distance between centers of eccentrics in fore and aft position* to the reversed line of the link, giving a shorter radius for the link than the distance from center of axle to center of link. By this simple means the greatest disturbing element in link motion designing is laid to rest. The inequality due to angularity of connecting rod still remains, and can be overcome by slight movement rearwards of center of supporting link. ING.

Vertical Plane Coupler.

Editor National Car and Locomotive Builder:

I have read with considerable interest the deliberations of the New England Railroad Club meeting for January in regard to the Vertical Plane Coupler, as given in the February number of your paper, not on account of any pecuniary interests but on general principles.

They seemed to me to be one-sided in their views. I cannot see why railroads should discard this style, at least not until after they have tested it more thoroughly.

It is true that the expense of keeping up the coupler at present is great, and will be so long as they are used in mixed trains, on account of broken couplers and knuckles, which is caused by the fact that when they are coupled to a common drawhead there is a slack of about four inches, which causes the common drawhead to strike against the coupler with great force when the trains are stopping, or going down into and coming up out of a hollow where there are grades.

This constant hammering and sudden jerking is what breaks the knuckles and couplers.

I would say in this connection that the damage is not confined to the couplers only; the cars are wrenched and injured, the freight is knocked about inside the cars and damaged (the damage to freight amounts to a great deal in the course of a year, as all freight claim agents are aware). Human arms, hands and fingers are lost by the use of the common drawhead, for all of which losses the railroad companies pay no paltry sum each year in settling claims and paying damages.

If the cars were all equipped with the vertical plane couplers, I think I am safe in saying that the expense of keeping them up would be reduced at least 50 per cent., besides doing away with links and pins; the 4 inch slack in trains would be taken up, that pounding and jerking done away with, when cars would run along smoothly, the contents not being disturbed except as the result of rough handling while switching; and last, but surely not least in consideration, men's arms, hands and fingers would be preserved.

The principal argument brought against the use of the vertical plane coupler was the expense of keeping it up.

If they wish to know something of the cost of maintaining this style of coupler, and the advantages sustained over other drawheads, let them start a train from Chicago, fully equipped with the Vertical Plane Coupler, and run it through to New York City. This would fully demonstrate the fact that there would be but few broken couplers and knuckles.

Mr. Marden believes the link and pin coupler to be more economical than the Vertical Hook; I do not understand how he can believe that to be the case, if he had taken everything into consideration. As I say, it may cost more to keep up the Vertical Coupler just now, but that does not prove that the other is the most economical.

FOREMAN CAR REPAIRS.

A New Defect Card.

Editor National Car and Locomotive Builder:

For your information I attach herewith our new style of defect card, which I have introduced for various reasons.

You will see it is simply the regulation card, with the stub end giving the same information as the card.

When an inspector applies a card, he detaches the stub, having filled the same out to read exactly as the card, sending the stub to the office of the Master Mechanic of the divison on which he is employed. This serves a number of valuable purposes, principal among which is that the Master Mechanic can tell in what proportion his inspectors are carding cars, and if possible get the movement of cars and see if the cars that are being carded from day to day, were actually damaged on the road or received by other inspectors, at interchange points, in bad order.

In the next place, the Master Mechanic, by having these stubs in his office, can immediately check bills for repairs of cars rendered by other roads, without having to send out to the various inspectors to check up and O K the bills.

Another very important feature, by the use of these stubs the Master Mechanic can check up other roads and ascertain if any changes were made in the cards after they were placed by our inspectors. This point is a very good one, and one which we are constantly required to look out for, from our past experience. WM. GARSTANG,

Superintendent Motive Power.

Chesapeake & Ohio Railway, Richmond, Va.

C. & O. R'Y.

_____ 189

Car No._____ Initial_____

has been carded by me this

day to_____ R. R.

for following defects:

_____

_____

_____

_____ Inspector

at_____

Send Bill with this Card to Wm. Garstang, Sup't Motive Power, Richmond, Va.

CHESAPEAKE & OHIO RAILWAY CO.

Car No._____ Date_____ Initial_____ Line_____

Will be received at any point on this Company's line with the following defects:_____

NOTE.—Fill in defects on both sides with ink or indelible Pencil. Attach this Card securely to the inside cross-tie timber.

_____

_____

_____ Inspector at_____

[*Printed on both sides.*]

Effects of Throttling Steam.

Editor National Car and Locomotive Builder:

There is a long letter in your paper from George H. Baker about the "Effects of Throttling Steam," in which I think the writer makes mistakes, at the same time by errors in reasoning coming to conclusions that cast reflections on the Master Mechanics' Association and on the locomotive engineers of the country. To argue in a general way that it is better to run locomotives with the reverse lever close hooked up than to use a late cut-off and regulate the speed by the throttle will be hitting close to the truth and to good practice. But not always. There are times when circumstances alter cases, even in the handling of the reverse lever of a locomotive.

In an article on link motion published in the December number of the NATIONAL CAR AND LOCOMOTIVE BUILDER you had considerable to say about mistakes made in designing link motion for locomotives. There are railroads where badly designed motion is the rule and not the exception. There are few other railroads where some engines with badly designed motions are not reducing the usefulness of the locomotive. A very common fault of design results in causing excessive compression during short cut-offs. This compression not only makes an engine uncomfortable to run and to ride on, but it causes wastefulness in the use of steam. An engineer running a locomotive of this kind readily falls into the practice of working the engine where the work can be done most smoothly. A locomotive that requires a special kind of handling to work well has a tendency to make engineers handle other engines in the same way, for they naturally reason that what is necessary for one will be good practice for all.

There are no doubt some engineers who are very indifferent about coal saving, or about doing their work well; but these men do not represent the average practice. If engineers are sometimes made indifferent about the interests of the company they work for by bad treatment or petty annoyances, they are rarely indifferent toward their fireman, and they will do their best to save coal on his account, if for no other. And the modern fireman, filled with book and magazine learning, is not slack in expressing his sentiments against running with the lever in the corner, against "hard hitting," and any other practice which he conceives will call for ten scoops of coal where nine ought to suffice.

Intelligence about their business, good sense and fireman's self-interest are all urging the engineer to run his engine in the way that will require the least expenditure of coal, and there are few men who care to defy these influences. So most of them drop into the way of running their engines in the way that is lightest on the coal pile. This may sometimes be in eight inches, when the work might be done more wastefully cutting off at six inches.

Mr. Baker's remarks about indicator diagrams are all right as far as they go, but the indicator diagram does not tell everything that is going on inside the cylinder. Mr. Baker does not appear to be aware that initial cylinder condensation plays an important part in the economical use of steam, and that the manifestations of condensation are not to be detected in the diagram taken from a locomotive cylinder. It may also be news to him that throttling superheats the steam and makes it more energetic than saturated steam in a cool cylinder. Owing to this it may sometimes happen that while the indicator diagram appears to show a saving of steam in a card taken at six inches over one taken throttled at eight inches, the cylinder is really using less steam when the latter card was taken.

As to the remarks made in the Master Mechanics' report which roused Mr. Baker's criticism: The committee was dealing with compound locomotives, and mention was made of the well-known fact that it is more economical to wire-draw the steam by throttling when small horse-power is required than to cut off short. Every man familiar with engineering practice knows all about the proofs that Mr. Baker wants supplied. Your correspondent is really too verdant in trying to put the blame of his own ignorance on the Master Mechanics' committee. B. RICH.

Philadelphia, January 25, 1891.

Locomotives Are Generally Well Handled.

WASHINGTON, PA., Jan. 30, 1891.

Editor National Car and Locomotive Builder:

In January number I noticed a communication by Mr. Baker, on the subject of using steam expansively in the locomotive cylinder. Your correspondent's criticism of Master Mechanics' Committee was as unfortunate as his personal mention of the Chicago, Burlington & Quincy engineers.

After reading the communication one would suppose that enginemen are very indifferent about working the locomotive in an economical manner.

Your correspondent was unfortunate during his firing experience, it seems. During fifteen years' experience on the locomotive, I have found few engineers of whom I could reasonabiy complain because of unskillful handling of the engine. Using the knowledge gleaned from experience and observation, they usually work the locomotive in such a manner as gives best results. While it may be true that railroad companies lose something from unskillful handling of locomotives, it is also true that many locomotives are in such condition that it is quite impossible to make much of a record for economy in handling them.

Master mechanics do not always know the actual condition of their engines. A great deal depends on the intelligence and ability of foremen in charge of overhauling shops whether engines are turned out in proper condition or not. Builders and master mechanics do not always give enough attention toward having quadrants, reverse levers and throttle arrangements constructed in a manner that will permit engineers to work engines to best advantage. If a loose cab was mainly the cause of C., B. & Q. engine using so much fuel, the cab should have been tightened up; besides, its liability to shake loose suggested a want of adjustment or proportion in some parts of the locomotive. Suppose that cab had tumbled off and killed a section man!

A certain locomotive works many years ago built engines of such bad riding qualities that an engineer on one of them was likely to forget all the pious instructions and admonitions received during youth. Several roads have a few of those locomotives in service yet. The mogul locomotive, if not nicely proportioned, makes a bad riding

engine, particularly when boxes become worn so as to allow a little end play; those engines then develop a disagreeable swaying motion, seemingly at right angles to center line of track. J. J. C.

Car Inspection and Inspectors.

Editor National Car and Locomotive Builder:

The rules of interchange, joint and independent car inspection have been freely and fully discussed in the NATIONAL CAR AND LOCOMOTIVE BUILDER, both editorially and otherwise, for the past few months, from many points of view; but the actual operative inspector who has to keep the traffic within the bounds of safety and without delays, and yet live up to the rules of car interchange, has yet said but little to show his view.

The car inspectors, we are told, "act on the assumption that cers are brought from foreign roads for the purpose of giving them the opportunity to display the brief authority with which they are invested," yet this same ir responsible abuser of authority has a code of rules—"regulating the interchange of cars, that are nearly as perfect as they can be made," to which he must and shall conform, to interchange cars by, cars of a hundred different patterns and each particular one, of course, perfect. He must use the rare tact and business ability neither to cause blockade in his own yard, nor to inundate his own road with cars that will not bear passage over it, or that other roads will refuse when they have passed over it; and it is expected of him that he will perform his duties so smoothly that the "ominous attention" of the general manager will be distracted from the car inspection and directed to some other department. This he must do with the cheapest kind of help, just a degree removed from the trackman, who are to be kept well up to their work in daylight or darkness, neither shaded in summer nor sheltered in winter. Is it not fairer to hold the systems of car inspection to blame at least as much as these men? Should not railroads obtain and maintain a uniform system of inspection, that shall be enforced with the most rigid impartiality wherever the main shops of a road are located? and then taper them off, if any, at the interchange yards? It occurs to me that if the two following items were inserted as a preamble to the rules it might indicate to the users of them what they were for, in a measure:

1. Do unto others as you would they should do unto you.

2. That a railroad company being a transportation company, the aim of all its employés should be the quickest movement of the largest number of passengers and the greatest amounts of freight the longest distance in the shortest time.

These might prevent the oversmartness of many men who now often forget them.

"DOPE BUCKET."

Trade Inquiries.

A correspondent writes us: "Some time ago I saw an advertisement in one of the mechanical papers of a firm that was making stay bolts for fire-box crown bars, and the nuts for the same. These nuts were finely made, with a raised collar on one side making the joint on the crown sheet. Can you tell me who the maker is?"

Another correspondent says: "We want to buy a small working model of a locomotive. Do you know of any one for sale?"

We cannot answer either of these inquiries, and we will be thankful to any of our readers who will give us the required information.

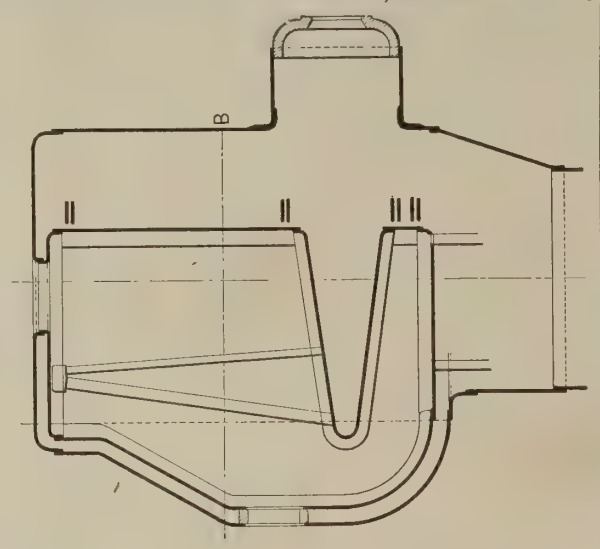
A correspondent who gives no address asks us for information about the price of valve motion models and about our illustrated supplements, which can only be answered by private letter.

A Pittsburgh paper writing of Benjamin F. Free, an old passenger engineer on the Pennsylvania Railrord, lately deceased, says that during the Centennial at Philadelphia he ran his engine 422,100,000 miles without repairs. A few millions of miles do not count much with Pittsburgh papers when they are telling lies about locomotives.

The discussion that has been going on in our columns for some time about car inspection is enlivened this month by a racy letter from a car inspector, who makes some cutting comments on the common practice of putting upon the car inspector the blame of every dispute that leads to delays of cars at inspection points. Superofficiousness and the desire to be oversmart are rampants among other men connected with car interchange besides car inspectors, and it is only fair to saddle on the right shoulders the blame of delays that result. Blame is frequently put upon car inspectors for delays that occur through a fair and honest interpretation of the rules of interchange; but laws and rules cannot well be strictly enforced without some one being considered officious for doing his duty. The men who establish the rules of interchange are frequently the real originators of delays placed upon car inspectors.

A Downard Draft Fire-box.

During a recent visit to New England we heard considerable talk about the performance of a downward draft locomotive which was built some time ago by the Portland Locomotive Works. The annexed engraving shows the design and arrangement of the fire-box. The fire rests on a water tube grate and the draft toward the flues is downward, a peculiar form of combustion chamber intervening between the fire and the flue openings. The fire-box was applied to an ordinary 18 × 24-inch locomotive, and the engine was tried on the Maine Central. It handled a train of two passenger cars with considerable difficulty, the leading shortcoming being shortness of steam. The cylinders were bushed down to 16 inches, and still sufficient



steam was not forthcoming to make the engine a success in any ordinary service. She is now laid up waiting for improvements, and another engine of the same type of fire-box is projected with enlarged proportions.

The claims made for their invention by the proprietors of the patents covering this boiler are, that the thing is a perfect smoke preventer and highly economical in the use of fuel. The arrangement is represented to have been successfully applied to heating stoves and to stationery boilers. This may be so, but we submit that it is unsuitable for locomotive purposes. A boiler may be capable of making a success for stationary service and yet be entirely unsuitable for application to locomotives, and this we consider a case in point. A special characteristic of a locomotive boiler is that it must be capable of generating steam with great rapidity. An attempt to force the downward draft fire-box as the ordinary locomotive fire-box has to be forced, would make it dangerous to the men on the footplate of the engine. If the water tubes that act as grates were to be subjected to the intense incandescent heat present on the surface of many ordinary locomotives, they would be very liable to burn out and scald the occupants of the cab, for the circulation of water in the grate tubes must necessarily be imperfect and mixed with steam where evaporation is so rapid. A curiosity about inventions of this kind is, how they delude practical men who might be expected to perceive their shortcomings at once.

Wanting Military Railroad Men.

The State of New York has a Board of Mediation and Arbitration. The principal business of the members of this board is the drawing of their salaries, but they lately conceived the idea of astonishing the people by doing something. The New York Central Railroad strike gave them the opportunity and they determined to devise a preventive of such conflicts in the future. Their high and boastful neighs raised ardent expectation, but the whole thing has ended in a very weak bray.

To prepare the way for peaceful settlement of disputes between employer and employé some basis of mutual interest must be established. The tendency of the time is toward making employer and employé perfectly free agents. Proposing to put either in a position that will be more vulnerable to the arm of the law is the attempt of the blind to lead those who are not suffering from defective vision. All that the New York State Board of Mediation and Arbitration has to offer is an absurd militarist scheme that might work in Germany, but is utterly foreign and repugnant to the spirit of our institutions. If the board had been composed of members accustomed to the handling of men they might have devised something practicable.

The following are the recommendations of the board:

"1. The service rendered by railroad corporations created by the State is a public service.

"2. Entrance into such service should be by enlistment for a definite period, upon satisfactory examination as to mental and physical qualifications, with oath of fidelity to the people and to the corporation.

"3. Resignation or dismissal from such service to be permitted for cause, to be stated in writing and filed with some designated authority, and to take effect after the lapse of a reasonable and fixed period.

"4. Wages to be established at the time of entry, and changed only by mutual agreement, or decision by arbitration of a board chosen by the company and employés, or by a State board, or through the action of both, the latter serving as an appellate body. Other differences that may arise to be settled in like manner.

"5. Promotions to be made upon a system that may be devised and agreeable to both parties.

"6. Any combination of two or more persons to embarrass or prevent the operation of a railroad in the service of the people a misdemeanor; and any obstruction of or violence toward a railroad serving the people, endangering the safety of life and property, a felony with punishment of adequate severity.

"7. Establishment of a beneficiary fund for the relief of employés disabled by sickness or accident, and for the relief of their families in case of death, as is done upon the lines of a number of railroad corporations in other States."

Profit Sharing in Locomotive Shop.

On Feb. 9, 1891, H. K. Porter & Co., the light locomotive builders of Pittsburgh, made their fifth annual "voluntary distribution" to the workmen employed. This system of profit sharing has thus far proved quite satisfactory in a business point of view. It is in no sense a charity scheme, although its benefits cannot be altogether estimated in dollars and cents. No definite agreement is made between the firm and the workmen, and no promise is made of continuing the distribution unless it continues to prove to be to the best interest of all concerned. The essential feature of the plan is to encourage among all workmen an ambition to excel and to take pride in the quality of the work turned out, and also to increase the quantity of the output. The firm believes that if by any effort on the part of the workmen the grade of work can be improved and the cost decreased, it is only fair for the workmen to have the benefit of the saving, especially as the buyers of the locomotives turned out under such a system are also benefited.

This "voluntary distribution" system has increased the output of the shop, and has decreased the cost of the product although not to the full extent of the amount distributed. The firm realize that any experiment of this kind must be educational and expect better results after a longer trial. The system produces many incidental good effects, such as a feeling of good will between the firm and the workmen, and also, what is equally desirable, a feeling of community of interest between workmen in different parts of the shop so that any narrow-minded attempt of one set of men to benefit themselves to the injury of the rest is unpopular. In one case a man who, rightly or wrongly, was supposed to shirk his work was cut by the rest of the shop for about six months.

This system does not in any way interfere with trades unions, unless in case of some action on their part plainly to the damage of the rest of the shop and to the firm, such as refusal to work with a non-union man, or interfering with any apprentice system, and in such case the men acting against the best interest of the shop are left out in the distribution. There is also a tendency to educate workmen into good all-round machinists, carpenters, smiths, etc., as no piece work is done, and men are set to using their heads as well as their hands, and to practice economy in use of time and material. Naturally there are plenty of applications for places, and thus poor men are likely to be dropped. Long continuance in the employ of the firm is considered in the distribution, and those who have been longest in the shops receive a larger proportion. The amount distributed is a large one, and makes a considerable addition to the years' wages, but H. K. Porter & Co. do not feel it would be wise to give exact figures in this respect.

At Wilmington, N. C., the Atlantic Coast Line are building and will continue to build about 20 freight cars every month. They are put up in first class shape with air brake and all modern improvements. They are also applying brakes to the middle wheels of all trucks with three pairs of wheels.

In the case of Philip Carpenter, who recently sued the New York, New Haven & Hartford to recover $40 stolen from him in a sleeping car, Chief Judge Follett, of the New York State Court of Appeals, states the measure of the obligation of railroad companies running sleeping cars as follows: "A corporation engaged in running sleeping coaches with sections separated from the aisle only by curtains is bound to have an employé charged with the duty of carefully and continually watching the interior of the car while berths are occupied by sleepers. These cars are used by both sexes of all ages, by the experienced and inexperienced, by the honest and dishonest, which is understood by the carriers, and though such companies are not insurers, they must exercise vigilance to protect their sleeping customers from robbery. A traveler who pays for a berth is invited, and has the right, to sleep, and both parties to the contract know that he is to become powerless to defend his property from thieves or his person from insult, and the company is bound to use a degree of care commensurate with the danger to which passengers are exposed. Considering the compensation received for such services and the hazards to which unguarded and sleeping travelers are exposed, this rule of diligence is not too onerous."

Luxurious Trains.

The following description of the cars composing the Pullman new trans-continental train is taken from the New York *Sun:* The trains consist of vestibule drawing-room and sleeping cars, an observation car, a dining car and a composite smoking car. The vestibule composite car is a magnificent affair, and is exclusively for men. A forward end is set apart for baggage. A compartment between the baggage room and the main saloon is fitted up as a barber shop and a bath room. Adjoining the bath room is a café. The rear section of the car is a smoking room. The vestibule sleeping cars, of which there are four on this train, are said by the managers of the Pullman company to be the best examples of their work ever turned out. They each contain twelve sections of two double berths and two drawing rooms. Movable incandescent lights are attached to each section in order to allow one to lie in a berth and read. In one of these sleeping cars is a bathroom for ladies. The dining car, besides containing ten tables, at which forty persons can dine at once. also contains a kitchen large enough to allow four cooks to work at once. An observation car will bring up the rear. The body is an open sitting room, finished in hard wood and furnished with upholstered rattan arm-chairs and lounges. Among its conveniences are a writing desk, a large case of selected books, movable tables and an upright piano. But the main feature of the car, and the one which gives it its name, is the deep recess at the end of the car. The platform will accommodate about twenty persons. In the forward portion of this car will be a small office, which will be occupied by a stenographer and typewriter, whose duty it will be to write and mail the letters of any or all of the tourists gratis.

Leap of a Locomotive.

Annexed engraving shows a locomotive as it stood after jumping off the high trestle shown behind it. The accident happened in a rather extraordinary manner. Some

ten or twelve miles from the spot shown there was a collision between this engine and a train pulling out of a siding, and the engineer and fireman jumped. The engine was very little damaged, but the trottle flew open and the engine ran away. It descended a long grade safely, and word having been wired ahead it was turned on the siding to the coal trestle shown. It made a clear jump into soft ground, and sustained very little damage, no axle or crank pin having been sprung. Had the tender not fallen on the cab, the engine might have been put right to work after being drawn away from the place where it fell.

Tests for Turpentine and Oil.

The following tests have been used for years by Mr. Charles Richardson, the well-known dealer in painters' supplies, Boston:

Take a clear white glass bottle, holding perhaps one ounce, and put in a small piece of iodide of potassium about the size of a bean. Fill the bottle half full of turpentine, cork it and shake thoroughly for about one minute, then let it settle. If the turpentine is pure, the crystals will remain perfectly white and the liquid will be as clear as spring water; if the turpentine is adulterated, the crystals will turn of a brownish color and the liquid will be of a sort of pinkish color.

By adding water to the contents of a bottle of about equal proportions of turpentine, shaking thoroughly and allowing to stand, the upper portion of the liquid will be of a lemon color and the lower portion will be nearly white; if adulterated, the lower portion of the liquid will be of an orange color and the upper portion a lemon color.

The most simple way of testing spirits of turpentine is by using a hydrometer. Have the temperature of the turpentine at 60, and, should the turpentine be pure, the hydometer would indicate 865. Should it vary much from this, you can rest assured that the turpentine is adulterated. This does not give you the percentage of adulteration, but it is a quick and positive method.

Take a two-ounce bottle; pour in equal parts of linseed oil and common nitric acid (say one-half ounce each); shake the mixture well and let it stand for 20 minutes. I the oil is pure, the upper strata will be straw color and the lower strata colorless.

The Compound Locomotive on the Chicago, Burlington & Quincy.

The compound locomotive which the Chicago, Burlington & Quincy Railroad has built at the Aurora shops from its own designs has now been running, says the *Railway Review*, for a couple of weeks or more. As we have already stated in these columns, the engine is practically the class "H' mogul with the cylinders compounded. The regular class "H" engine had 19 × 24 inch cylinders, and the cylinders of the compound are 20 × 29 × 24 inches. The parts of the engine which are necessary to the application of the compound principle are exceedingly simple and apparently very satisfactory, if one may judge from the indicator diagrams which have already been taken. The valve motion has features differing from those of any other compound locomotive in this country, and while some of them are found in European practice, the combination as a whole has never been applied to a locomotive before. The link on the low-pressure side of the engine hangs in a slightly lower position than the one on the high-pressure side, thus making the cut-off in the former cylinder later than in the latter for all positions of the reverse lever while in forward gear. This of course distorts the valve motion in back gear, but as the engine is designed wholly for road service, this is immaterial. The lower position of the low-pressure link (produced by dropping the reverse shaft arm the required amount) would provide for a certain difference between the cut-offs in the two cylinders, and this difference would be practically uniform for all positions of the reverse lever; this does not fully meet the requirements, however, for in order to distribute the steam to the best advantage, and to equally divide the power between the two cylinders at all points of cut-off, the difference between the two should be greater for early than for later cut-offs. This is accomplished in the following manner: The reverse shaft is made with one vertical arm, forged or keyed on, and one horizontal arm from which the link of the low-pressure valve gear is suspended. The reverse rod is attached to the vertical arm by means of a link about 2 feet long. The horizontal arm which controls the position of the link of the high-pressure cylinder is loose on the reverse shaft, and is operated by a second vertical arm which connects directly to the reverse rod in the usual manner. The vertical arm for the high-pressure gear is, however, larger by 5 or 6 inches than that which controls the low-pressure gear, and as both are attached to the same reverse rod the high-pressure link must be raised or lowered a lesser distance than the low-pressure link by a given movement of the reverse lever. This accomplishes the desired result, and makes the ratio between the cut-offs in the two cylinders a variable one.

In starting the engine live steam is admitted to the low-pressure cylinder by means of a starting valve which is operated by the reverse lever, in the same manner as the Lindner starting gear. The cylinder saddle is so made that the passage for the live steam to the high-pressure cylinder is very close to the passage by which the steam goes from the high-pressure cylinder to the other side of the engine, and both are close to the outer side wall of the saddle. These two passages are tapped and connections between them controlled by a small plug valve on the outside of the cylinder saddle. This plug valve is rotated by a connection to the reverse rod, and everything is so adjusted that when the lever is in full gear, either forward or back, the plug cock is open and live steam can pass into the receiver and thus to the low-pressure cylinder. As soon as the lever is hooked up a notch the valve is closed, and the engine works compound. It will thus be seen that the reversed lever is handled in the usual way and that by means of it the engine is worked non-compound in starting and changed to compound as soon as it is hooked back; and that the cut-offs in the two cylinders are never alike, but always vary from each other in such a ratio as will practically give equal powers in the two cylinders.

The engine has been running between Aurora and Chicago in regular freight service. It has thus far taken fairly heavy loads, but has not been run at high speeds. The greatest speed at which any indicator diagrams have been taken is 20 miles per hour. At this and lower speeds the indicator diagrams are very satisfactory, and do not show any features which high speed would exaggerate or make objectionable. After the engine has been sufficiently limbered up in freight service it will be run at higher speeds, and a very careful series of experiments conducted in connection therewith.

The Atlantic Coast Line, under Master Car Builder J. H. Davis, has built fifty logging cars and are completing 100 freight cars; also at work on four mail cars. Air brakes, iron brake beam, automatic couplers, pressed steel corner plates, and all modern improved appliances are used in this freight equipment. Everything indicates the most efficient management of this department under Mr. Davis.

Worsting a Cowboy.

In some of the Western grazing regions the appearance of a railroad train is a pleasant break in the monotony of the cowboy's existence, and the members of that class of rough riders are always ready to make the best of the passing excitement which the train brings. They will ride for miles to the track and yell to the engineer, shout the compliments of the day in a free and airy fashion to the passengers, kiss their hands to any pretty girls to be seen at the car windows, and ride a losing race as long as they are within hail of the train. In western Kansas there is a long steep grade on the Atchison, Topeka & Santa Fe, where the ascending trains would toil up so slowly that the cowboys could ride alongside and visit with the train hands for a mile or two. One cowboy they called Red Pete got to be remarkably free in the liberties he took with trainmen and pasengers. He would ride up beside the engineer and ask for a chew, he would joke with the brakemen and conductor, and make fun of the butcher. In summer, when most of the car windows would be open, and the dust-covered passengers lolling out to catch a breath of vitalized air, Red Pete would grasp any verdant-looking man by the hand and squeeze it till the owner yelled. To attractive members of the fair sex he was exceedingly liberal with expressions of devotion, and he seldom paid a visit to a train without inviting some lady to light off and become the wife of his bosom.

One day Pete made some facetious remarks about the personal appearance of a raw-boned miner, with hands nearly the size of a No. 3 coal scoop, who was leaning out of a car window. Pete bore no malice with all his fun, and, wishing to finish up in a friendly way, he held out his hand to shake with the miner before leaving. The miner grasped Pete's hand with wonderful cordiality, and displayed extraordinary interest in all that was going on. He wanted to know all about the cattle business, and offered the cowboy a pair of boots for his pony. That being rejected, he tried to establish some other basis for a trade. Meanwhile the train had got over the summit and was working with speed on the down grade, but the miner clung to the hand of the cowboy and encouraged him to spur up the gait of his pony. The train got beyond the pony's pace, and, following his hand, which was still inclosed in the ample grip of the passenger, Red Pete slipped over the head of the horse, and hung dangling at the side of the car like a weasel nailed to a barn door. A small creek ran alongside the track, and it still contained pools of slimy water that the heat had failed to lap up. When the miner thought that he had got all the fun out of the cowboy that could be made, he let him drop down so that he rolled softly into one of the slime puddles. The last that the trainmen saw of Pete was a statue of mud, with half a dozen cowboys, who had followed, rolling on their horses' backs in fits of laughter.

Eucalyptus Extract as a Scale Remover.

Many of the railways in India traverse calcareous regions that produce water as badly impregnated with lime salts as anything to be found in our Western States. The result is that how to keep boilers free from incrustation, is as pressing a problem as it is on many of our railroads. Of course all sorts of remedies have been tried, and the quack with his lotions was driving a roaring trade, as he always does where a malady is raging that defies the skill of the regular practitioner. There are few chemicals with the least affinity for lime that have not been tried as a preventive of scale, and numerous mechanical appliances, guaranteed to prevent incrustation and to remove with certainty and dispatch what had been formed, all had their day and were declared to be wanting in utility. The case appeared to be growing hopeless, and the men in charge of the motive power were concluding that the constant caulking, patching and renewing of sheets was inevitable, when some one tried the extract of eucalyptus leaves. This is reported to have proved an effectual anti-incrustation agent.

The eucalyptus is an Australian gum tree which thrives in all warm climates. It has a thick glossy leaf which stands upright and receives the rays of the sun on both sides. The leaves are rich in a volatile oil, which is the substance that acts on the lime salts with the effect that formation of scale is prevented. There are many regions in the southern states where the eucalyptus tree would thrive and do good, for its presence is reported to be a specific against malaria. The tree was planted extensively in the swampy regions near Rome and is said to have greatly decreased the malarial fevers of the districts.

The extract of the leaves for use in boilers of the Indian railways is obtained in a very simple fashion. The leaves are collected and slowly boiled, about one thousand gallons of strong fluid being produced from fifty pounds of the leaves. Three gallons of this extract is used for a trip of 100 miles, and keeps the boiler in the condition that all impurities deposited by the feed water can be readily washed out. When a boiler is foul with scale about twelve gallons of the eucalyptus extract is put in after washing out, and the incrustation immediately begins to soften, and soon falls off in large pieces. By keeping up the treatment and washing out thoroughly the worst boiler will be cleaned in about two months.

Master Mechanics' Association Circulars.

Two committees of the Master Mechanics' Association issued circulars of inquiry last month.

Mr. John Mackenzie, who is chairman of the Committee on "Relative Value of Iron and Steel Axles," says to members:

1. Have you had any steel or iron axles break under locomotives or cars? If so, please give the original diameter and also the diameter and mileages at the time of the fracture. If the axle was steel, please say if open-hearth, Bessemer or crucible. If iron, give the formula for making the billet, and whether muck bar or scrap.

2. In your practice do you find that steel axles give more service than iron between turnings? Please give the comparative mileage of the two, and also say if open-hearth, Bessemer or crucible, and if scrap or muck bar.

Mr. John Hickey, chairman of the Committee on the Present Status of the Car Coupler Question, says:

One of the most important reforms now pending in the railway practice of this country is the question of the introduction of automatic couplers for freight cars. The matter has come into prominence not because of its economic features, but for the protection it affords against injury to the large number of persons engaged directly in the operation of freight trains in this country. Desiring to aid in the solution of the coupler question, the American Railway Master Mechanics' Association has appointed a committee to ascertain whether this Association can indorse the action of the Master Car Builders' Association in recommending the vertical plane type of coupler as a standard from a mechanical standpoint. It is not thought best to submit a large number of questions, as is the usual custom, but it is asked that you give your opinion, based on observation and experience, as to the advisability of applying it to all freight cars as a matter of economy and safety.

Please give your views fully on the following points:

1. Do you recommend the introduction of the vertical plane type of coupler known as the Master Car Builders' standard for freight cars as an element of safety to human life, and can you indorse it, viewed from the standpoint of economy?

2. If you have a preference for another style of coupler that will accomplish the results sought, please give its name and general features of construction.

3. What changes, if any, would you recommend in the vertical plane (M. C. B.) type of coupler as at present constructed?

4. From a mechanical standpoint, do you regard the Master Car Builders' standard coupler, as at present constructed, as efficient as any known device for the purpose intended?

Travel to the South is said to be heavier this year than ever known before, all of which should operate as an incentive to the railroad managers to furnish faster trains and abandon the practice so much the present rule of doing the local business with through trains; 24 hours is ample time to make the runs between New York and Jacksonville. Where this is done travel will show the most gratifying improvement. The invalids—and a large percentage of this travel is this class—should be given every speed and comfort possible and not worn out by tedious and wearing trips.

At the January meeting of the Southern Railway Club a letter was read from Mr. E. S. Marshall of the St. Louis, Arkansas & Texas, in which he claimed that derailment was sometimes caused by hanging brake shoes too low on the wheels and from the car body. He mentioned cases of tender trucks jumping the track when the brakes were applied. On investigation he found that the shoes pressing upon the lower portion of the wheels had the effect of lifting up the wheel when the car lurched upwards. By hanging the shoes farther up the difficulty was overcome.

In speaking at a meeting of the Southern Railway Club, Secretary Marshall said: Brake beams suspended from the car body do not bear the proper relation to the wheel at all times. The trucks swivel in going around a curve, and if they are of the swing motion type there is an additional amount of lateral displacement, all of which must be accounted for in the brake beam hangers. Some roads which have used stirrup-shape hangers fastened at one end with a pin have found that these are bent first one way and then another until finally broken, and they have been compelled to give up this form and return to the old style of hanger, with an eye in either one or both ends. But this form of hanger is objectionable because it allows the brake beam to be entirely displaced if the finger guards are worn away. The inside brake has the advantage of always maintaining a proper relation to the wheels.

There was a meeting of railroad officers interested in the interchange of cars held at Detroit last month to consider questions connected with the plan of joint inspection at Detroit and Toledo. Among those present were Messrs. Miller, of the Michigan Central; Kirby and Waite, of the Lake Shore; Martin, of the Wabash, and others whose names we have not obtained. The only change to be made at Detroit is that the inspectors are to be under the control of the joint inspector, while inspecting cars for interchange. In other respects no change is to be made from the original plan. At Toledo, the territory being so large, the joint inspector is to have two assistants, with the same authority as at Detroit. This change was decided on after a full discussion by all the parties interested.

Old Men and Old Machines.

More than 20 years ago there was on the Delaware, Lackawanna & Western Railroad an old engine at Greenville. It was one of those eight-wheeled camel-backs by Ross Winans which could pull the tracks off the face of the earth if it could only get proper coupling links. It was used to take extra cars over the hill at Greenville. As years went by and the engine got old, she fell into the hands of old Ralph Max, who was at last her regular engineer. There had been many of these engines on the road, and, as everybody knows, Ross Winans' engines are interchangeable. So, in time, when they wer mostly out of service, he kept up the repairs on his machi by robbing other engines as they were dismantled. A cylinder came from this one and new boxes, side-rods and cross-head from that. They got the flash name on the road of "cabbage cutters," because they ground so in going around the curves.

The old man, at last, never put any repairs on the slate for her. He took care of her, and knew every turn of every bolt and nut in her. As she grew older and more cranky, other engineers would try to take her out when he was ill, but it was no use. She got into such a condition that she would not pull a pound for any other man. There was not a man about the shops nor roundhouse that would undertake to handle a train with her, not knowing at what moment she might shake her valve gear down on the track. So, when the old man did not put in an appearance for any reason, they would put her in the roundhouse and wait till he got ready to take her out. He knew the old rattletrap so perfectly that when he was ready for work he would go about her and give a half turn here on a screw and set this or that up just so much, and open her up in just such a style. And one of those engines, as full of whims as the proverbial woman, required a genius to run successfully. She was not put into the scrap heap because she cost nothing for repairs and was one additional available machine whenever the old man was able to work, which for many years was six days every week. But the man grew old like the engine, and one day he did not respond to the voice of the caller, so the engine was given a rest because no one could be trusted to take her out. A few days afterwards, unusual stillness reigned in the engine house, for every man who could be spared had gone to swell the mournful procession that followed Ralph Max to his last resting place.

How Officers Are Drawn Away from Employes.

Speaking on the statistics showing the growth of railroads presented by the Hon. Abram Hewitt at a meeting in the New York Railroad Men's rooms Mr. Depew said: "But there is a side to the railway world which is only seen through institutions like that of which this in New York City may be said to have been the real beginning. His figures show that in 1840 there were only 3,000 miles of railway in this country, with probably, at five to the mile, only 15,000 men. Then everybody knew everybody on every road. I remember in my boyhood that the conductor and the station agent were the most important people in Peekskill, Laughter]. They represented more than any one in the village; they were out in contact with the world and they brought into the town more than any body else. But when you reach the figures of 150,000 to 160,000 miles and 800,000 employes, you pass beyond the period when the officer knows his men, or when the men know the executive officers of the company; when they can even see or recognize the superintendents and the assistant superintendents; or the heads of the different departments. You come to a period where there is an immense association on the one side of those who are similarly engaged and upon substantially the same plane of occupation, and they are without direct contact or sympathy, with the directors or superior officers of the road, and this leads to dangerous misunderstandings, likely to produce just the disastrous results which Mr. Hewitt has outlined."

The Harlan & Hollingsworth Company are building a handsome private car for President Robinson, of the Seaboard Air Line.

The N. Y,. P. & B. have let two coaches to the Gilbert Car Company and four to Harlan & Hollingsworth, and three engines to the Rhode Island Company.

Perhaps the most fruitful field for antiquities in the railway department is in the South Carolina Railroad territory. This road was the first 100 miles put in operation in the world. We hope in our next issue to present our readers with several objects of interest in this line dating back to 1828 and 1833.

The New York Central has just given out a contract for the building of 400 new stock cars. These will be the finest stock cars owned by any railroad company, and will be used for rushing stock through to New York on fast time. The cars are 36 feet long, and are carried on trucks having elliptic springs 36 inches long. They will have feeding racks and watering troughs. All of the cars will be equipped with the quick-acting air brake and the Master Car Builders' type of coupler.

The New York & Northern have let eight coaches to the Gilbert Car Company.

The Georgia Railroad, it is said, have just let contracts for 10 engines and 6 coaches to Baldwin and the Ohio Falls.

The Delaware & Hudson Canal Company have ordered 100 additional freight cars of the Buffalo Car Company, making in all 1,100 cars.

The Chicago & Northwestern Railroad has just placed an order for 79 coaches with Pullman Car Company, to be equipped with Scarritt-Forney seats.

The Chicago & West Michigan Railroad has just placed an order for the equipment of 10 coaches with the latest pattern of Scarritt seats with adjustable foot rest.

It is a remark able fact that the percentage of breakage of the automatic coupler is very much less in the South than in the North. To what is it attributable? is the query.

The New York, Lake Erie & Western Railroad has recently placed an additional order for equipping 25 coaches with Scarritt-Forney seats, which will now aggregate 48 cars of the latest design of Scarritt seats.

The South Carolina Railroad is negotiating for the sale of 10 second-hand engines and the purchasing of 12 new ones. Business is very heavy on the road. Marked improvements are observed in the equi pment and roadbed.

Manning, Maxwell & Moore, New York, one of the largest establishments in the country, have secured from the War Department an order for 25 of the largest sized gun lathes. This, with the former order of eight lathes, makes 33 on government order for the Pond Machine Tool Company's lathe, and the order, amounting to over a million dollars, is confessedly the largest single order ever placed in history for machine tools. These lathes are for boring and turning 12-inch steel guns, the government having been unable to make larger than 8-inch bore.

One of the main things for an inventor to learn in the invention of machinery is to have in every machine as few parts as possible, to make them direct-acting, and have the machine or thing, as a whole, easily operated. Mr. Edison once said that very many meritorious inventions that were made were not successful because it required some skill and brain work to operate them. "To make a success of a thing," he added, "you must have it so simple that a mule can operate it. Then you have a thing that will come into general use, if presented to the world in a business way."

Work is progressing rapidly at the immense plant of the Madison Car Company, at Madison, Ill., the new manufacturing city at the east end of St. Louis' new bridge. The foundry building, 650 feet long, is practically completed, the other buildings being the engine and machine shops, 750 feet in length, and the wood mill and erection shops, of 925 feet in depth. The product of this concern will comprise freight cars of every description, car wheels, castings, and forgings, with a capacity of 40 cars per day. The works will likely be fully completed May 1st, and will be equipped with all the latest appliances and machinery.

The Cleveland Twist Drill Company have moved their New York offices to 100 Reade Street. They are carrying a large stock of twist drills and reamers in the office, and they invite parties interested in that line of goods to call and examine them.

The new works of the Mt. Vernon Car Manufacturing Company are now in full operation. They are working on 250 box cars for the Jacksonville Southeastern Line; 200 refrigerator cars for the Union Refrigerator Transit Company; 100 coke cars for the Louisville & Nashville Railroad; 125 furniture cars for the E. & T. H., L. E. & St. L., and P. D. & E. roads.

The Gold Car Heating Company are fitting up several cars of the West End Street Railway Company of Boston, Mass., with their device for heating as applied to street cars. The steam is taken in at regular stations, and the pipes are so arranged that the heat can be regulated so as to keep an even temperature throughout the entire car. The boards under the seat are perforated top and bottom, so that the heat is applied where most needed to the feet and knees of the passengers. This is a great improvement, as there is no dust and no danger of scorching clothes.

The Thomson-Houston Motor Company have published a book of maps of the United States, showing the places where central station plants and electric railways are in operation on their system. The territory embraces nearly the whole of the United States. This company has enjoyed great success, not only with their installations of electrical plant for lighting and operating street railways, but for the transmission of power in all departments of industry. They are sending out thousands of electrical motors for operating elevators, hoists, cranes, transfer tables, pump drills, and numerous other lines where the use of a motor dispenses with a steam plant.

No. 1 Universal Grinding Machine.

This machine, made by the Brown & Sharp Mfg. Co., Providence, R. I., is suitable for both straight and taper, internal and external grinding, and is used in making tools and gauges and manufacturing small parts of machines.

All straight bearings are scraped to surface plates, and all cylindrical bearings are fitted by grinding. The wearing surfaces are carefully protected from emery dust, and the ways of the bed and wheel stand are always covered.

The feed gearing is completely inclosed, and dust caps protect the spindle bearings of the head and foot stock and wheel stand. All oil holes are provided with plugs and screws. The ways of the bed are self-oiling. All screws, bolts and nuts requiring frequent adjustment are hardened.

The base rests upon three feet, and is fitted as a closet. The sliding table moves on one V and one flat side, and carries a swivel table which turns upon a center pin. This swivel table carries the head and foot stock, and thus the machine may be set for grinding tapers without throwing the centers out of line. When set to any desired position for heavy work, the swivel table is clamped at each end to the sliding table. For ordinary work the weight of the table gives sufficient stability so that clamping is not required. The table is easily and accurately set to the desired taper by an adjusting screw and scale graduated to show the taper both in degrees and in inches per foot. The T slot in the table is scraped to a straight edge and the tongues of the head and foot stock are scraped to fit the slot. The head and foot stock may be set at any point on the platen.

The wheel bed rests upon the rearward projection of the base, which extends to the floor, and stands upon one of the feet by which the base is supported. A semi-circumference at the lower edge of the wheel bed is graduated to degrees so that it may be set at any desired angle relative to the sliding table.

The wheel platen rests on a flat circular bearing, the mean diameter of which is greater than the distance between the bearings of the wheel spindle. A steady support for the wheel stand is thus provided, and rocking is prevented.

The wheel stand and adjoining parts are rigidly connected with the rearward projection of the base, so that vibration of the wheel is obviated. The spindle is hardened steel, the boxes phosphor bronze.

The feed of the table is engaged by pushing a knob in the center of the hand wheel on the front of the machine. It is positive and cannot be disengaged by vibration of the machine. When desired, the table can be moved by the hand wheel.

The table is reversed by a lever actuated by dogs that are the same as dogs on a planer. For very delicate adjustments of the length of stroke, the lever carries a patented device; and the lever and adjoining parts are cushioned by a simple arrangement, so that the table is reversed without shock or jar—an important feature in accurate grinding.

The cross feed is operated by a hand wheel graduated to read to five ten-thousandths of an inch, and the emery wheel is fed equally well in whatever position the wheel bed or wheel platen may be set.

This universal character of the wheel stand, wheel platen and wheel bed is of great advantage especially in grinding abrupt tapers internal or external.

The head stock swivels upon a center pin, and its circumference at the lower edge is graduated to degrees so that it can be set at any desired position within the whole circle. The spindle is steel; the boxes phosphor bronze. Work may be ground upon two dead centers, upon one live and one dead center, or may be held in a chuck on the head stock. Two tapers can be ground, either internal or external, without changing any of the settings.

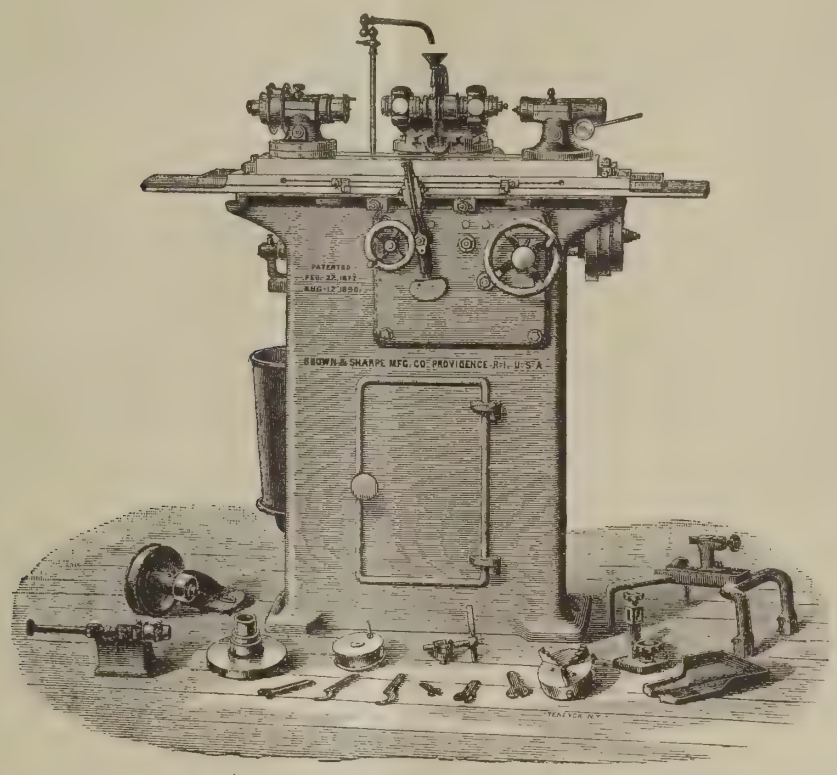
The foot stock spindle is quickly operated by a lever and the spindle held by a spring, so that the pressure between the centers remains substantially constant.

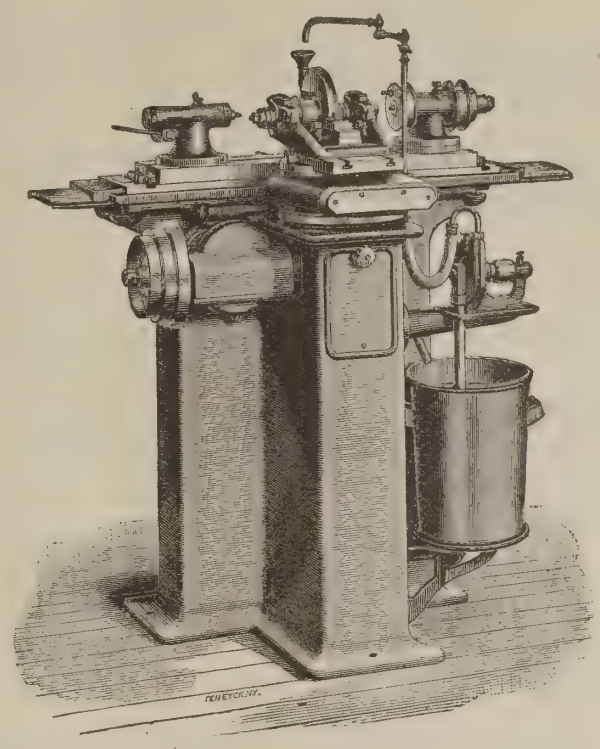
The machine will swing work between centers eight inches diameter and sixteen inches long, while the table may be fed several inches beyond that length. The swivel table will swing to either side of its central position to grind tapers from zero to 1½ inches per foot, or from zero to three and one-half degrees in angular measure. For grinding work on the face plate or chuck, the head stock can be set in any angle within the whole circle. The wheel slide has a movement of four inches, and may be fed at any angle from zero to ninety degrees on either side of a line at right angles with the slide bed. The wheel stand will take a wheel seven inches diameter and one-quarter thick with a two-inch hole in center.

The internal grinding fixture usually sent with this machine will grind holes 5 inches long and ¾-inch and upward in diameter. Wheels not larger than 1 inch are used with this fixture.

Each machine is provided with an internal grinding fixture, a special speed counter for internal grinding, a three jawed chuck, special chuck for thin cutters, center rest, back rest, wheel-truing stand, tooth rest, pump, wrenches, dogs, and complete overhead works.

The overhead works consist of three shafts with two drums, tight and loose pulleys 8 inches diameter for 3-inch belt, and hangers w -oiling and adjustable boxes. The shafts are arranged for any speed from 2,000 to 3,400 for emery wheel, and for six speeds between 93 and 640 for the work. The counter-shaft should run about 280 turns per minute.





NO. 1 UNIVERSAL GRINDING MACHINE.

Improved Screw Machine and Turret Lathe.

The screw machine and turret lathe, herewith illustrated, are manufactured by the Garvin Machine Company, New York.

They comprise their latest designs in this class of lathes, of which they manufacture a very complete line.

The screw machine is known as their No. 3 size and is 14 inches swing, 4½ feet bed. It is arranged with power feed and automatic stop. The feed rod and connections are placed on the front of the lathe for convenience in handling. The feed is tripped by means of an adjustable dog, carried on top of the turret slide.

The spindle runs in composition boxes, and has a 1½-inch hole its entire length. The outer end of spindle is threaded for chucks, or is made with automatic spring chucks and wire feed.

The spring chucks used are of new pattern, which have no end motion when gripping stock.

The turret is 8 inches diameter, with eight 1½-inch holes for tools, and has a movement of 12 inches. The cross slide is made with rack or screw feed, and with stop for each tool.

The head is made as shown, with back gears, or with plain cone, or back gears and friction clutch. The friction clutch head admits of changing instantly from fast to slow speeds or stopping as desired. This is particularly valuable when using large dies, or when different parts of the work vary largely in diameter.

This machine is also made with extra large spindle when desired, which gives a 2⅛-inch hole in spindle, or 1½-inch hole with wire feed and spring chuck. The pan for chips is especially large and has side extension where chips accumulate, with oil pot at end, where it is not liable to become clogged. Countershaft has self-oiling boxes, with friction pulleys 14-inch diameter, 4-inch face.

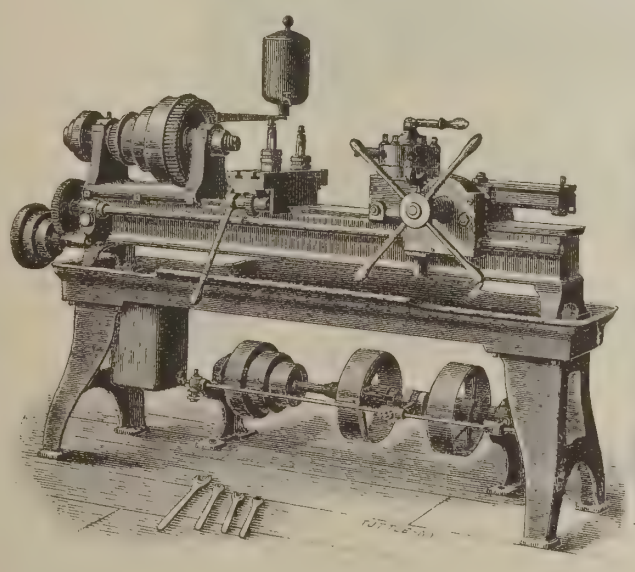
Weight of machine, complete, 1,600 pounds.

The turret lathe, here shown, is designed for all classes of work where oil is not required. It is made with the same heads, spindles and turret as No. 3 screw machine, and with plain chuck, spring chuck or wire feed.

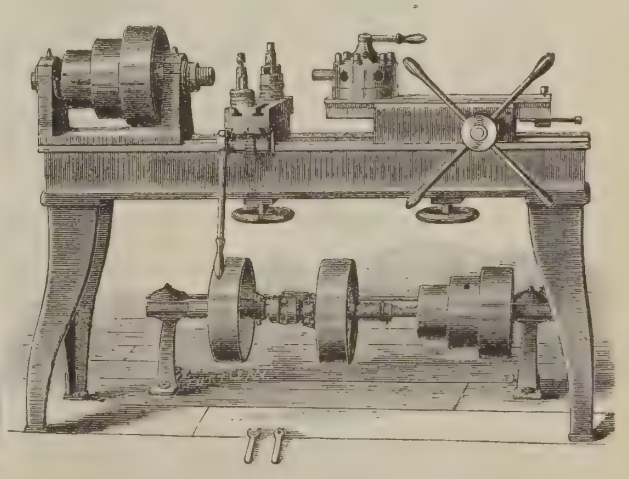
It is also made with draw-in chuck operated by hand-wheel at back of spindle. It is 16 inches swing, and the bed is of open pattern with V's.

The cross-slide and turret-block are clamped with hand-wheel shown. Countershaft has friction pulleys 14 inches in diameter, 4-inch face.

Weight of machine, complete, 1,400 pounds.



NO. 1 GARVIN.



NO. 2 GARVIN.

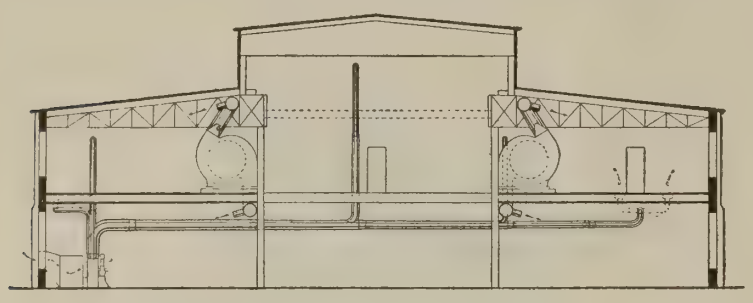
The automatic temperature regulator of the Consolidated Car-heating Company is now in use by the Wagner Palace Car Company, the Boston & Maine, the Maine Central, the Fitchburg, the Delaware & Hudson Canal Company, the Buffalo, Rochester & Pittsburgh, and the Baltimore & Ohio R. Rs. The Consolidated fire-proof heater is now in use by the New York, Providence & Boston, the Boston & Maine, the Intercolonial, the Buffalo, Rochester & Pittsburgh, the Lehigh Valley R. Rs. and the Wagner Palace Car Company.

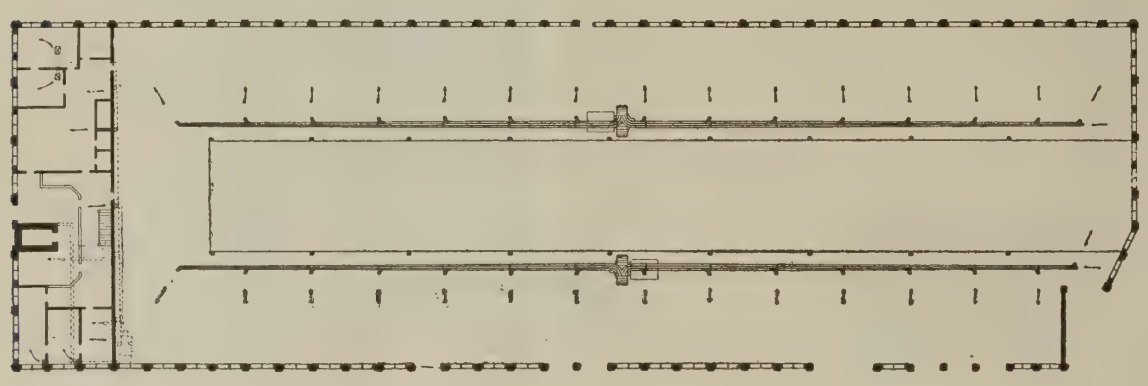
The Maris Machine Company, 146 Broad street, Philadelphia, manufacturers of portable hoisting machinery, have moved their plant to 234-45 Callowhill street. This new factory giving them a floor space fifteen times greater than their old one, enables them to turn out much more rapidly such orders as they may receive.

Heating and Ventilating of the Link Belt Machinery.

We present herewith a plan and sectional elevation showing the arrangement of heating and ventilating system recently introduced in the works of the Link Belt Machinery Company at Chicago, on a plan which is well adapted for railroad shops. The new building is about 400 feet long, 120 feet wide, and 48 feet high to the top of the monitor. It is of the "gallery" type, having two floors, but all opening up into the central space.

In place of the old time arrangement of heating by direct steam pipes either strung around the room or overhead there





were introduced two Sturtevant fans as shown in the section. Each fan was placed upon the gallery floor and provided with two outlets, one discharging upward at an angle into a pipe running lengthwise of the building and supported in the roof trusses, while the other discharges directly through the floor into a similar pipe. Each fan is provided with a direct connected upright engine designed for high speed and carrying upon its shaft the fan wheel which draws its air through the heater seen in the plan. This heater consists of a series of sections formed of cast iron bases with vertical rows of steel pipes cross-connected at the top, and so arranged in connection with the cast iron bases as to cause continuous circulation up, over, and down the pipes. The entire group of sections is supported upon a stiff angle iron foundation frame and inclosed in a steel plate jacket which connects with the inlet of the fan.

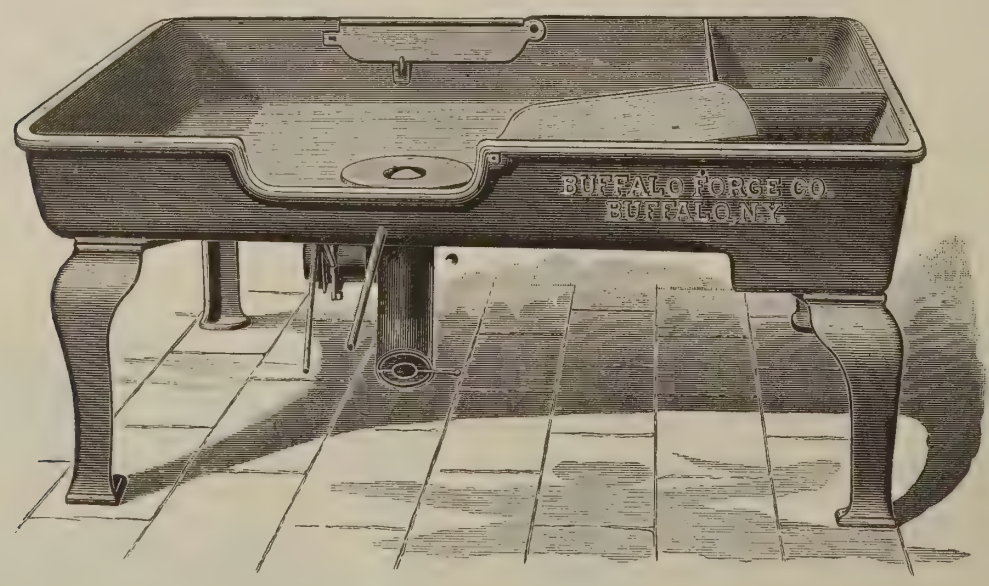
The end of each heater case is specially arranged with doors so as to take the air either from the gallery floor, from beneath the floor, or from overhead. The air in the pipes is distributed to the different parts of the building by means of the outlets as shown. It will be noted that all air is discharged toward the cold outer walls, striking them midway of their height upon each of the floors; the air becomes slightly cooled, falls to the floor, and is gradually forced out toward the center of the building, warming the occupants in its course, and finally passes up toward the monitor above. By the large number of outlets provided, thorough distribution and slow currents are secured, and the building is heated equally throughout. The heater is supplied with exhaust or live steam at will, and all of the steam from the engine driving the fan is always utilized. As the heaters are placed upon the gallery floor the return to boiler is by gravity thus securing a very convenient arrangement.

The entire system of heating and ventilating was introduced by the B. F. Sturtevant Company, of Boston. Owing to the large volume of air brought in contact with the heating surface in the heater only about ¼ to ⅛ of the pipe is required in this system, that is necessary in a direct steam system; there is no extended system of steam piping; it is all massed in the single heater under the control of a single valve, with no danger from leakage or freezing. The power of control over the temperature of the building is double; either a part of the steam may be shut off from the heater, or the speed of the fan may be changed; in fact, in moderate weather, when the building is warmed up, the exhaust steam from the fan engine is often sufficient for the heating of the entire building. In any case the expense for the operation of the fan engine is practically nothing, as all of the exhaust steam, being as efficient for heating as live steam, is utilized in the heater. With this system the building can be more rapidly heated up in the morning and more readily kept at an even temperature. The same system has already been introduced in a large number of prominent buildings in Chicago, as well as throughout the country, and its success is evidence that it is the coming system for heating and ventilating.

Buffalo Stationary Blast Forges.

The accompanying illustrations show an improved forge designed for use in shops provided with "fan" blast, and to meet the requirements of extra heavy work. The fire pit has a depth of 8 inches, thus admitting of a strong deep fire necessary for handling large and heavy work; when it is desired to run light work upon the forge, provision is made that the gates on the sides can be opened and the fire lowered 4 inches to suit.

The tuyere iron is of a kind especially designed to withstand heavy service without burning out, and is fitted with a 3½ inch wind-gate or valve for regulating the blast. The water and coal boxes are cast in one piece, with the fire pan divided by a sloping partition for the easy removal of coal. In every respect this forge is far superior to, handsomer and cheaper than any brick forge which could be constructed. It is equipped with all the conveniences for handling work quickly, and without doubt is the most complete forge for a wide range of light and heavy work yet produced.



The manufacturers of the "Buffalo" forges have a large number of different patterns and styles designed to meet every possible requirement, and are constantly on the alert for improvements which may be suggested by users.

The above forge, known as a "No. 03" stationary, was originally gotten out for the heavy work required in railroad shops, and many points of its superiority are the results of suggestions from the master mechanic of the Union Pacific Railroad, a large number being used for heavy work in their different shops. The size is 61 inches + 48 inches, height 26 inches, and weight 720 pounds.

The Pullman Sash Balance Company, Rochester, N. Y., have lately received from the Barney & Smith Company an order for 3,808 balances.

We are in receipt of an invitation from the Consolidated Car Heating Company to attend a test of the company's hot-water circulating system on trains running between Albany and Troy on March 11 and 12. The system is said to working admirably.

The Wakefield Rattan Company, of Boston, Mass., have received an order from the Boston & Maine Railroad to furnish the car seats (Henry patents) for the twenty passenger cars that the Laconia Car Company are building for them. They have also orders on hand for their car seats from a number of Western and Southern railways.

The Hale & Kilburn Manufacturing Company, of Philadelphia, have recently opened one of the finest suites of offices in the Phenix Building (rooms 422 and 423), Chicago, where they are displaying a complete line of their patented car seats, etc., where Mr. H. S. Hale or their representative, Mr. E. S. Canman (son of "Bismark" Editor of Chicago *Tribune*), will be glad to see all their friends.

The Berry & Orton Company, Philadelphia, Pa., manufacturers of wood-working machinery for car shops, etc., finding their present factory inadequate to their rapidly increasing business, have purchased a plot of land 123 × 148 feet on the northeast corner of Twenty-third and Arch streets, where they propose to erect a five-story building which will be devoted entirely to the manufacture of wood-working machinery, thereby doubling their present producing capacity. Machinery manufactured by this company will be found in the majority of the well-equipped car shops throughout the country.

The Railroad Commissioners of the State of Maine in their annual report to the Governor and Legislature of that State, just submitted, make the following reference to the Consolidated Car Heating Company: "While by the use of steam for heating purposes the danger to passengers from fires is eliminated, there is yet much to be done by way of application of the system to make travel in ordinary passenger cars comfortable. We are pleased to be able to state the Consolidated Car Heating Company, whose system is generally in use in this State and in New England, recognize the importance of a perfect circulating system and are constantly making improvements thereon."

We have received from the Staunton, Va., Development Co. a particularly attractive and interesting pamphlet illustrating and describing the numerous attractions of the place and of the beautiful region where the town is situated. The foundations of the town of Staunton was laid in early colonial days by the descendants of the Scotch Covenanters, who fought fortheir faith at Bothwell Brig and Killiecrankie. It came natural for the men whose fathers had been for agreat part of their lives fugitives in theScottish moors and mountain fastnesses to choose as a location the breezy uplands of the Shenandoah Valley. The same energetic race appears now to be striving vigorously to develop the rich resources of the region and a great city is rapidly growing out of the rural foundations of the old town.

Our Directory.

Allegheny Valley.—D. McCargo, general superintendent, died at Allegheny City on Thursday Feb. 5.

Atlanta & Florida.—J. C. Shafer has been appointed master mechanic.

Baltimore & Ohio.—F. H. Britton, superintendent Chicago Division, has resigned.

Chicago & Erie.—R. F. Kredell has been appointed master mechanic.

Cleveland, Cincinnati, Chicago & St. Louis.—S. H. Harrington, mechanical engineer, has resigned.

Dunkirk, Allegheny Valley & Pittsburgh.—W. G. Taber has been appointed master mechanic.

Georgia County.—E. S. Scheetz has been appointed master car builder, vice T. M. Preval, resigned.

Grand Trunk.—L. J. Seargeant has been appointed general manager.

Gulf, Colorado & Santa Fe.—C. F. Ward has been appointed master mechanic, vice J. J. Tomlinson, resigned.

Monterey & Mexican Gulf.—F. C. Barron has been appointed master mechanic.

Norfolk & Western.—P. Wallis has been appointed master mechanic.

Richmond & Danville.—W. H. Green has been appointed general manager.

Sinnemahoning Valley.—G. T. Johnson has been appointed master mechanic.

St. Louis & Southwestern.—E. H. Osborne has been appointed master car builder Pine Bluff (Ark) shops.

Toledo, Ann Arbor & North Michigan.—W. F. Bradley has been appointed master mechanic vice A. Galloway, resigned.

Union Pacific.—P. Tuohy has been appointed superintendent of Colorado Division.

Employment Wanted.

A mechanical draftsman and engineer (32), with 14 years' experience at the construction and designing of railroad rolling stock, seeks employment as such with a railroad or car manufacturing company. Best of references. Address P. O. Box 211, Milwaukee, Wis.

A machine shop foreman who has been employed in introducing the piecework system into railroad shops, and is unusually well posted upon that and other lines of locomotive repairs, wishes a position as master mechanic with charge of shops. Apply to editor of this paper.

NATIONAL CAR AND LOCOMOTIVE BUILDER

APRIL, 1891.

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St. Paul & Duluth have ordered five coaches from Barney & Smith.

Blaine Brothers, of Florida, are at work on 300 cars for the F. C. & P.

Several additional engines are to be ordered by the Western Railroad of Alabama.

The Concord road have just placed an order for 10 coaches with Jackson & Sharp.

The Savannah, Americus & Montgomery are reported to be in the field for several engines.

The Rogers Locomotive Works are about ready to deliver three engines to the New York & Northern.

The Maine Central have placed orders with Schenectady for three and Rhode Island for five engines.

The boiler of a locomotive on the Shenandoah Valley Railroad exploded last month, severely scalding the fireman.

"I've made some pretty tough springs," said the car-spring manufacturer, "but nothing to compare to the spring of 1891."

Cast-iron ties are now manufactured at Burrakur, Bengal, and at the works of the East Indian company at Jamalpur, Bengal.

The Delaware, Lackawanna & Western are building a culm burner in their shops at Utica, similar to the Graham engine which we illustrated several months ago.

The Philadelphia & Reading has 650 anthracite-coal burning locomotives, and one that burns soft coal. The man running the soft-coal engine is called the sky painter of the road.

At a recent meeting of presidents of the Vanderbilt roads Mr. John Newall, of the Lake Shore & Michigan Southern, took a very decided stand against the vertical plane coupler and intimated that he intended adopting the Safford automatic coupler.

At the April meeting of the New England Railroad Club, the subject for discussion will be "Air Brakes for Freight Trains, their Car Condition and Efficiency." The discussion will be opened by a paper from Angus Sinclair, editor NATIONAL CAR AND LOCOMOTIVE BUILDER.

There is wailing and kicking among a lot of men who were lately passenger conductors on the Michigan Central. The velvet-footed spotter crept among them and train service knew them no more. They protest with one voice that the spotters drew on their imaginations for the knocking down reported.

The car starter has again made its appearance in practical service. This time it is an electrical street railroad in Albany, N. Y. After stopping on an ascending grade the car is permitted to run back a foot or so, which compresses a spiral spring, and the push of this spring, it is claimed, aids the car in starting.

The South is fast becoming the Mecca for the youth and capital of our whole country. It is particularly noticeable in the number of young but most capable mechanics who are planting themselves in this section, and we believe it is a wise move for all concerned. The field is large and no crowding can be brought about for years to come.

The new Argentine Pacific railroad, from Buenos Ayres to the foot of the Andes, has what is probably the longest tangent in the world. This is 211 miles without a curve. In this distance there is not a single bridge, and no opening larger than an ordinary culvert, no cut greater than one metre in depth, and no fill of a height exceeding one metre.

The Chicago & Northwestern Railway have air brakes and M. C. B. couplers on 2,100 heavy ore cars. The brake rigging as originally made was too light and there has been considerable wear of jaw holes and pins, but they are putting in the M. C. B. sizes for all renewals and when that is done the parts wear well. There has been little trouble with breakage of the vertical plane coupler.

In its annual summary of boiler explosions *The Locomotive* presents a table showing that it recorded the bursting of 226 boilers, against 180 for 1889. Of the first number 75 were explosions in saw mills and wood-working establishments, which led the list. Locomotives come next with 25 explosions. The explosions of 1890 resulted in the death of 244 persons, and the injury of 351, so far as reported.

Since the middle of February the Grand Trunk shops at Point St. Charles, Que., have been turning out engines at the rate of one a week. In the next six months it is expected that 15 more new engines will be built at the shops. The Canadian Locomotive and Machine Company, at Kingston, Ont., is finishing its order for 10 engines at the rate of one a week.

The *Boston Transcript* says that a locomotive steamboat is being built at Kristanstad, Sweden, for the navigation of a small chain of lakes separated by falls. The boat is to be fitted with wheels fitting a track, and power can be applied to either the propeller or the driving-wheels of the locomotive part of the craft. The track is 3 feet 6 inches gauge, with grades of 1 in 35, and curves of a radius of 100 metres.

There are already over 10,000 miles of railroad in Japan. Most of the railroad building and the supplying of the machinery has been done by British capitalists. There are a number of Baldwin locomotives in use on some of the roads, and they are holding their own so well in competition with those of English build that there is an encouraging lookout for American builders obtaining a fair share of that business.

Mr. Paxson, superintendent of motive power of the Philadelphia & Reading, has a great many cars equipped with vertical plane couplers, and he has devoted a great deal of personal attention to watching breakages, investigating with unusual thoroughness every individual case of failure of these couplers. He informs us that he has never seen but one knuckle broken that was done by the concussion of another vertical plane coupler.

Mr. A. Reasoner, superintendent of the Delaware, Lackawanna & Western, writes us protesting vigorously against the statements made in a paragraph that appeared in our last issue respecting the switches used on the road named. Mr. Reasoner assures us that the company use Wharton safety switches and maintain their track in an excellent condition, which we have found on examination to be correct. We also believe that our informant distorted facts in writing on the cause of the Paterson accident.

Many of our exchanges display great carelessness about treating us to our full name since the change was made. We are touchy about the correct appellation of this journal being given, and endure the keenest torture when we are spoken of as the *Master Car Builders' Journal*, the *Locomotive and Car Gazette* and the various other diversities that inaccurate memories put upon us. But the *Iron Trade Review* has filled up the cup of our bitterness to overflowing by crediting an article taken from our columns to the *Natural Gas and Locomotive Builder*.

The New South Wales railway papers that have reached us lately have been full of fierce denunciations of Mr. Eddy, the railroad commissioner of that colony, who dismissed the foreman of the interlocking department because he refused to quit a labor association of railroad men. Mr. Eddy went to New South Wales from the London & Northwestern Railway, and we should judge from the remarks made about him in the colonial journals that he would wish himself back in England, where the discharging of a foreman would cause no public comment no matter why it was done.

Frank S. Gannon, John D. Campbell and Frank W. Coolbaugh met together lately, and as usual began exchanging reminiscences of the Erie and the Lackawanna. One story was told of Sam Johnson, an engineer on the Lackawanna, who was noted for bluster and swagger and boasting. That was away in the war time, and boasting Sam was also noted as a rabid Southern symphathizer. The drafts were frequent at the time, and Sam used to declare not only that he would defy the government if he was drawn for a soldier, but that he would kill the officer who read his name from a draft roll. Some of the boys thought they would put up a job on Sam, so they went to the clerk whose duty it was to read off the names drawn and asked him to call out Samuel Johnson among the first, although it was not drawn. The railroad men were waiting to witness the fray that was to ensue. The name was called and Sam was there, but to their astonishment nothing happened. Next morning it was found that Sam had departed for Canada.

In the early days of railroading in this country the brake shoes, or rather blocks used on all cars, was made of wood, sometimes lined with leather. On steep grades there was great difficulty experienced in keeping the blocks from getting burned by the heat of friction, and renewals had to be made so often that the labor and expense of keeping up the brakes was serious. There was a belief that no metallic substance would do for brake shoes. The first man to thoroughly demonstrate the fallacy of this belief was Samuel L. Moore, then master mechanic of a New Jersey railroad. He not only applied cast-iron shoes to all the cars under his charge, but arranged the leverages so that cast iron held just as well as wooden shoes. Other roads gradually fell into line, but for years afterwards experiments would be made in other parts of the country to find out if cast-iron shoes could be made to hold, and after the proper adjustment of levers was reached the report would be made that the officers of the company had discovered that cast iron was all right.

When a runaway horse comes in contact with an express train, it is generally hard on the horse; but it appears that even this rule has exceptions. While an express train loaded mostly with New Jersey Congressmen was passing New Brunswick lately, a runaway horse was seen to dash at the train. Some of the spectators thought that the horse wanted to pass over the platform, but others thought that he was an inspired Nemesis bound to show the Congressmen the errors of their ways. Anyhow, the animal struck the train at the platform between the last car and the one ahead of it, struck the end of one of the cars with terrific force, and then was thrown against the front end of the rear car. Its heels went through the window by the stove, smashing it all to pieces. Then the horse plunged around, tearing the paint from the cars, and finally fell down and suddenly disappeared. Some people who are as well informed as their neighbors say, however, that the horse is still lying in wait in the Jersey meadows, keeping his weather eye open for a load of Congressmen riding in a weaker car. He intends taking a turn through the most Congressman-inflicted of the Western States after finishing his work in the Mosquito State.

There are still great bodies of this timber standing in the United States, especially in western North and South Carolina and in eastern Tennessee and Kentucky and in Arkansas. Railroads, however, are penetrating these oak forests, which inaccessibility has thus far preserved from the ax of the lumberman and the settler. Every year the supply is becoming less, and, if it is fair to judge of the future of our forests by their past, white oak, as a great forest product, must eventually disappear. The time has already arrived when the white oak is worth preserving. Few of our trees, indeed, better deserve care, especially as a danger more serious even than the ax is threatening to exterminate the white oak in the very region where it grows naturally in the greatest abundance. The acorns of this tree, like those of the other oaks with annual fructification, are unfortunately sweet, and are therefore hunted for and devoured by the hogs which are allowed to roam at will in great bands through the forests of the Southern States. They eat the white-oak acorns and pass the bitter fruit of the black oaks, which are therefore gradually getting possession of the soil and driving out more valuable species, so that it will be a question of time only, if the pasturage of our Southern forest is continued, when their most valuable tree will disappear.

When any man of unbalanced intellect invents something that is going, according to his views, to perform actions wonderful in connection with railroad operating he generally finds his way to New York. If all the man's friends sneer at the invention and railroad men declare it worthless, he persists in going to New York so the capitalists, who inhabit that region, may have the opportunity of increasing or decreasing their stock of wealth by interesting themselves in the invention. The tunnel disaster has lately brought an unusual influx of inventors to New York, and at every turn one is meeting men of untamed aspects with rudely carved models under their arms, that they are ready to demonstrate will relegate all sorts of railroad accidents into the realms of ancient history. One of these men got possession of the members of the Maritime Exchange a few days ago and they warmly sympathized with his indignation against the apathy and blindness of railroad men. "For $5 the recent tunnel disaster in this city could have been prevented," the inventor said. The scheme shows a double track near a drawbridge or other place of danger. By an agreement of the valve the car wheels are raised from the track and the cars rest on immovable supports, sliding on the extra track. The cars are thus by friction brought to a standstill at a train's length. All that is necessary to put the plan in working order is an extra track and a sort of cradle for each car. Why will railroad companies neglect the poor inventor?

In the Baldwin Locomotive Works.

Before the building of the fine new erecting shops by the Baldwin Locomotive Works it was always a marvel how the men in charge succeeded in erecting, in the contracted space available for the purpose, the large number of locomotives constructed every week in the shops. It goes without saying that great extra expense was incurred in doing the work. From being one of the worst provided establishments with erecting-shop facilities, the Baldwin Works are now about the best, since their highly commodious erecting shop was got in working order. This shop is certainly the finest machinery-erecting shop in this country, and it is managed in a style worthy of the magnitude and equipment of the building. From the outside the shop appears to be a two-story building, but inside we find that the space is open from the floor to the roof, and that the roof is covered with "saw-tooth" skylights, which admit the greatest amount of light without sunshine. The shop is 336 × 159 feet, and is divided lengthwise into two apartments that are traversed by Sellers electric cranes, each of 100 tons lifting capacity. There are 19 tracks in each apartment, each capable of holding three locomotives. Two tracks are reserved for the delivery of engines. Here all the finishing touches are put on and the valve-setting done. The tracks connect with others that lead to the outside world and open a way for the long journey which all the products of this establishment have before them. All the erecting-shop tracks are in charge of gang foremen, who are responsible for everything about the locomotives turned out. The tracks are numbered, and there are cases hanging in various parts of the shop with slides to represent all the tracks and slips thereon intimating the position of each engine and the name of the man in charge of the work. Every time that an engine is moved a corresponding change is made in the location case. This plan saves a great deal of time that would often be wasted in a large place like this in searching for a particular engine.

During the day of my visit there were 73 engines in the erecting shop and there were 25 different kinds among them. It appears that instead of working toward uniformity of locomotive design the railroad master mechanics of the country are demanding increased diversity of patterns. There is so much desire to impress the stamp of individuality upon the locomotives that few railroads follow the sensible practice of accepting the builder's standard engine.

There were in the erecting shop many locomotives intended for exportation. The foreign business of the Baldwin Locomotive Works is rapidly extending. About a third of the engines built for several months have been for export. They are sending a great many locomotives to South America and to the Australian colonies. Most of the engines sent abroad have copper fireboxes and wrought-iron wheels. The wrought-iron wheels are made in the works, and are as handsome as any forgings of this kind that I have seen. An engine that was in the erecting shop for the New York elevated railroads had wrought-iron wheels.

At one end of the erecting shop there are placed a number of machine tools, such as drills, lathes and planes, that are convenient for doing odd jobs connected with the erecting of the engines. The tools are away from convenient reach of line shafting, and they are run by an electric motor.

A late addition to the works is a dining-room, run by a semi-benevolent institution of Philadelphia, where about 800 men get a good dinner daily for a small sum. The company pay all expense connected with the dining-rooms except the purchase of supplies; consequently the men obtain the best of food without paying anything for cooking. This addition to the works is said to be highly popular.

A. S.

Where They Make Balanced Valves.

One of the best examples that we have found lately of adapting means to an end in mechanical operations was found in the shop run by the estate of F. W. Richardson, in Troy, N. Y. The place is not of a very imposing character, but it is particularly well provided with the means of making balanced valves at the lowest possible cost consistent with first-class work. The best tools for performing the different operations are provided, and the machinists being constantly engaged on recurring work are wonderfully skillful, so that no motion is lost. An hour or two spent in this shop is a good object lesson of how it is cheaper for railroad companies and locomotive builders to purchase balanced valves than to make them.

Besides balanced valves, the firm makes relief valves for steam chests, the well known Richardson valve motion model and a variety of other devices used by railroads. They are working on some small valve motion models for the use of lodge rooms and such places where men meet who are interested in obtaining elementary knowledge respecting locomotive valve gear.

One part of the establishment is devoted to the manufacture of springs for safety valves and for any purpose requiring particularly well graduated springs. This business originated with George Richardson, inventor of the pop safety valve, who first started the business that this shop has inherited. Mr. Richardson could not find in the market springs with resilience uniform enough for use in his safety valves, and after trying the product of a variety of spring makers without satisfaction, he turned his active mind and mechanical genius to the manufacture of fine springs. The business prospered, and the manufacturers in the East of all kinds of machinery requiring particularly even acting springs now call on the Troy works for what they want, and secure a satisfactory article every time.

Inspection of Air-brakes on Chicago & Alton Railroad.

While making inquiries about the provision made by railroad companies for inspecting and testing the air-brakes of freight cars, we received the following description from Mr. A. W. Quackenbush, of the plants for and methods of inspecting air-brakes followed on the Chicago & Alton Railroad:

This company has four established points for testing air-brakes. The plant at Chicago has everything complete. The material is the same as we put on the locomotive. It consists of a boiler capable of carrying 125 pounds of steam, air pumps, main air reservoir, new style engineer's brake valve and duplex air gauge. We use the steam from this boiler to pump the air, also to pump the gas in our coaches, to thaw out frozen steam pipes, and to clean out the coils of the heaters. The same boiler heats our oil room, after which the steam passes into a large water tank, and heats the water which we use to wash our passenger trains. In this way there is no waste of steam. We have 300 feet of ¾-in. pipe under the ground. At the end of the pipe, and every 50 feet, we put stop cocks, hose and couplings to connect to the cars, so we can test the brakes on the cars. We can test from one to fifty cars at the same time. We put an air gauge on the train pipe so we can tell whether the triple valves leak back in the train line. In this way we know that our brakes are in perfect order. The plant at Brighton Park for testing brakes on freight cars is the same as the one at Chicago. Our largest plant is at Bloomington; here we have over 2,000 feet of piping, as we test the cars in two shops, and also have two testing places out in the yard. We have two air pumps in this plant, also an air-brake instruction room for giving instructions to engine and train men. In this room we have 10 cylinders, 10 reservoirs, 10 triple valves, gauged hose, piping, everything complete to work the brake. We have the automatic, the quick-acting passenger and freight and the driving brake, which we can work all together or separately, and just the same as though they were in a train. At Kansas City we have a plant like the one at Chicago.

We have all the devices to test everything we use in the air brake, and men who make it a study to master the parts upon which they work. One man works on air pumps, another on triple valves, pump governors and engineers' brake valves, and another man puts the brake on all the tenders. The gang bosses put the brakes on the engine in the shop. Four men do all the brake work on the cars that are in the shop. All work is tested before it leaves the shop. This road, I believe, was the first in the West to put in the air brake plants for testing purposes. Other roads have been here to see it and are putting them in now. Plants of this kind should be put in at all the principal interchange yards. I know of no more important thing at this time than air brakes on freight cars, and the Master Mechanics and the Master Car Builders should give this matter their earliest attention and frame such rules that all roads shall give the air brakes the same attention that they give any other part of a car. So far they have made no arrangements whatever for inspection testing or repairing them. In conclusion I will say we will never have good brakes on freight cars until this is done. There is not over one-half of the foreign cars that pass over this road that have the air brakes in serviceable condition. There are thousands of dollars invested in freight car air brakes that do no one any good because they are not kept in order.

Failure of Steel under Tests.

When railroad companies become anxious to reduce operating expenses there is a raid made on every department that can stand cutting down without immediate injury to the earning capacity of the road. We have noticed of late a tendency of general managers to direct the first attack against the department of tests when they want to reduce expenses, there being an impression in some quarters that the force maintained to ascertain whether material is what it is reputed to be is of doubtful utility. Some facts about a material the maintenance of whose good quality is of the highest importance to the safe and economical operating of railroads have lately came to our notice, which convince us that there is urgent necessity for more rigid and systematic tests of railroad material. There is reason for believing that the principal makers of steel plates are growing careless regarding the quality of their product. The Massachusetts Institute of Technology recently called for bids for steel to be used in the construction of a boiler and the greatest difficulty was experienced in obtaining steel that would pass the tests called for in the specifications. The specifications were what ought to be imposed for all locomotive firebox steel and are no doubt called for by many railroad companies without being strickly enforced. They called for best firebox open-hearth steel three-eighths inch thick, having a tensile strength of not less than 55,000 nor more than 60,000 pounds per square inch, an ultimate elongation of not less than 20 per cent. in a gauged length of eight inches, and a limit of elasticity not less than 30,000 pounds per square inch, the steel to bend double cold, red hot and at a flanging heat without cracking. No lamination is to exist in any of the specimens or of the plates. From each plate to be used are to be cut four specimens, two lengthwise and two crosswise of the plate, each specimen being at least 18 inches long and planed on the edges to a width of one inch throughout its length, and is not to be annealed.

Every specimen of the steel furnished under these specifications failed when subjected to the careful tests made at the Institute. The principal cause of failure was lamination of the sheet when bent cold. Some of the steel makers asserted that the requirements were too onerous and could not be complied with, although the same men are willing to supply railroad companies with steel under the same specifications. They evidently rely on the steel being accepted without being subjected to careful tests, and it seems that their faith in loose inspection is well founded. Railroad companies are required to pay for the best quality of steel. It is the blame of those in charge if they fail to receive what is paid for.

Patent Swindlers in the Toils.

We have repeatedly taken occasion to caution inventors against a very numerous class of swindlers who are on the lookout to cheat patentees by obtaining money under the pretense that they have facilities for selling patents, when the object is to collect money. It has always been a mystery to us how the harpies who engage in this business continue to keep out of their natural home, the penitentiary; but they seldom go there, or, if they do, their places are soon filled by other rascals. We are gratified now to learn that some of these swindlers have got the grim grasp of Uncle Sam upon them. A recent dispatch from Springfield, Ill., says: "Frank B. Polk, salesman for the Co-operative Patent Company, has been arrested here charged with conspiracy to use the mails for fraudulent purposes. His brother, John R. Polk, general superintendent of the concern, was arrested at the same time at Hot Springs, Ark., on the same charge, and will be brought here for trial. Their operations, it is asserted, extended all over the United States, and they did an immense business. Their scheme was to issue circulars and get people to consign their patents to them for development. They would demand an advance fee of $10, and then never do anything with the patents. Frank B. was held in $1,000 bonds to appear for trial here."

An Electric Brake and Traction Increaser.

There was received in Philadelphia last month engine 806 of the Baltimore & Ohio to be put on the fast passenger service of the road. The engine is a heavy eight-wheeler of the Cromwell design, with cylinders 19 × 24 inches and 59-inch wheel centers. This class of engine made the run between Philadelphia and Washington in two hours and fifty minutes, 134 miles—being detained on the boat 15 minutes at Canton. The engine was sent to Philadelphia from the locomotive shops at Mount Clair, Baltimore, where she had been for six weeks in the hands of the Reid Electric Traction Company, of Baltimore, Md., who have equipped her with an electric brake and traction increaser. They have removed the sand box and have placed in front of the dome an engine and in front of the engine a dynamo, taking nearly all the space up to the bell. They have put two improvised sand boxes on each side of the engine under foot boards. The engine and dynamo stand as high as the top of the dome, and looks unsightly. The claim of the inventors is that they are going to do away with the use of the sand altogether and give railroads the best brake that has been invented. They are positive about the success of their machine. The apparatus did not give entire satisfaction at first, and the engine was taken to the Electric Traction Company's shops at Wilmington to make some slight alterations and she is now in service.

A month ago as a train on the Baltimore & Ohio Southwestern was sidetracked to let No. 4 pass at Remington, O., No. 4 came around the curve, before the other train had got clear of the main track, at such speed that it was impossible to stop it, and scraped the side of the third car of the sidetracking train for about 12 feet, catching the fourth car under the corner, turned it over on its side into the ditch, injured two ladies seriously, and several other passengers and the conductor received cuts and bruises. This car was equipped with the Consolidated Car-Heating Company's Fireproof Heater, which heater was located in the corner struck by the engine. Though the heater was somewhat loosened from its fastenings, lifted and tipped it was but slightly broken, and, notwithstanding a brisk fire was burning in the heater, no conflagration took place. Had the car been equipped with an ordinary heater, the trainmen say nothing could have prevented the car from burning.

Repairing Locomotives.

Second Paper.

BY J. T. HEFFERNAN.

To fit up and hang a set of frames that have been taken down for repairs, proceed in the following manner: Set the frames on the floor or on blocks as shown in Fig. 8, which will be more convenient. The first thing to do, then, is to determine if the frames are sprung. Take a long straight-edge and try it on the side and top of the frame; or if a straight edge of the required length is not to be had, a fine line may be used, instead. When a line is to be used stretch it over pieces of ½-inch wire, placing one piece at each end of the line on the side, and measure from it to the frame, along the length of the frame. A short straight-edge tried on the side of each jaw will show if they are sprung or out of true vertically. A more convenient way to try frames is to lay them on a face plate or planer platen; but as a face plate or a planer platen are not always to be had, the above way will be found to work very well. If on trial the frames are found to be sprung, they should be straightened before proceeding farther with the fitting up. When sprung they may be straightened by pening, or if out bad should be straightened by heating. After getting both frames straight, try a straight-edge on the face of the jaws, and if found to be out of true, face them up to a face plate.

Next face up the lugs to receive the pedestal braces. Try the pedestal braces on the frames, and if found to be loose they will require refitting. There are a number of ways of doing this. On some roads it is the practice of bracing pieces in the jaws of the pedestal brace, and this way has an advantage in that it does not throw the pedestal brace holes out. I will explain the method most commonly used, viz.: Having had them refitted in the blacksmith shop, try a brace on, and if it is found to be loose at A and A', but tight at B and B', it must be drawn in the center, but as drawing it in the center will make it loose at B and B', it must be upset in the jaws. Put a center punch mark on the brace, as shown at F, Fig. 6, and with a solid tram draw a line at F, Fig. 6, and from this line lay off a distance shorter than the tram the distance the brace is open at A and A'. Put a center mark on this last distance found. With a short tram lay off a distance D and draw a line. From this line lay off a distance longer than the tram the amount the brace is open at A, and center-mark it. From F as a center tram toward G and draw a line. From this line lay off a distance longer than the tram the amount the brace is open at A', and center-mark it. As the distance between the center mark at E and the center mark at F is shorter than the tram the amount the brace is open at A and A', when the brace is drawn so the tram will fit the centers the brace will fit tight at A and A'. Now, upset the brace in the jaw until the tram fits the centers D and F. This brings this end of the brace back to where it was and at the same time closes the jaw. Upset the other end in the same manner and the brace is ready to fit.

Now, suppose the brace is open at A, B and B', but tight at A'. Tram from F toward F and draw a line. From this line lay off a distance shorter than the tram the amount the brace is open at A and center-mark it. From this center at F tram towards D and lay off longer than the tram the distance the brace is open at A and B and center-mark it. From F tram toward G and draw a line. From this line lay out a distance longer than the tram the distance the brace is open at B' and center-mark it. Now, when the brace is drawn between F and F until the tram fits the center marks, it will be tight at A, but it will be loose at B the distance it was loose at A and B. Now, as we laid off longer than the tram at the center-mark D the distance the brace was open at A and B, when the brace is upset in the jaw until the tram fits the centers D and F, it will be tight at B as well as at A. Upset the other end of the brace until the tram fits the centers F and G and the brace will be done and ready for fitting. Instead of tramming from F to D and from F to G, the common practice is to tram from D over all to G and close the jaws by guess, until the distance between the centers D and G correspond with the tram. I don't like this way as well as I do tramming from F to D and from F to G, as the brace may require more closing at one end than at the other, and by tramming from F to D and from F to G we can measure the distance to close the jaw, while if we tram from D to G we must guess at it.

After closing all the braces proceed and fit them to the frame. On some roads it is the practice to fit the braces tight up to the frame at J, J, and on other roads to leave them stand off. When they fit them to stand off they give the reason that if the brace should become loose it can be drawn up. Now, when the brace gets loose it wears a shoulder on the brace and frame, which must be eased off before it can be drawn up. The shoe will have to be eased, too, in order to allow the brace to be drawn up after the brace has been refitted. I think the better plan is to fit the pedestal braces snug up to the frame, being careful to make it a good fit, and then if it ever becomes worn it can be taken down and refitted; but if braces are fitted properly they will remain tight, with few exceptions, until the engine comes in again for repairs. Again, when the brace is fitted to stand off, it has not as much bearing on the jaw as when fitted close up, and is therefore more liable to wear. After fitting all the braces ream the holes, and put in temporary bolts to hold the brace in place.

Face up the back end of frames to receive the tail bar. This done, the frames are ready to be put in place on the boiler.

Put the frames in their respective places as shown in Fig. 9, resting them on jacks or any convenient way, and fasten them to the fronts with temporary bolts. Now, set the frames level with the cylinders, both lengthwise and across. Run a line through each cylinder, extending it to the rear end of each frame. Now, a word about setting a line. There are a great many ways in use, but the simplest way I know of is to take a piece of ½-inch round iron and turn an eye on it large enough to go over a cylinder head stud, as shown in Fig. 12. Make a loop on the end of the line so that it will slip over the iron free. Set the iron about central in the cylinder, and, when adjusting the line, turn the loop on the iron and it will stay wherever put, from nearly a straight line on the top to nearly a straight line on the bottom, as shown by Figs. 15, 16 and 17. For calipering a line in the cylinder, Fig. 13 shows a gauge that is light and very handy. Take two pieces of ⅛-inch wire, point one end and round over the other. A piece of flat spring steel about $\frac{1}{32}$ inch thick and ⅜ inch wide, with a slot cut in each end to let the wires through and bend, as shown in Fig. 13, will hold them together securely, and the wires can be easily moved by taking hold of the ends of the spring and closing it a little.

Having set the lines central with the cylinders, measure from the line to the frame as close to the cylinder as convenient, and set the frame so it will measure this distance from the line over its entire length, and especially at each set of jaws. Set each frame this way, and then lay a straight-edge across the top of the frames and square from it to the side of each frame, and adjust them until the sides of the frames stand square with the straight-edge, at the same time being careful to keep the frames level with the cylinders. Take a gauge and try the distance apart of the frames. This distance may be taken close up to the cylinders; but as some frames are rough up near the cylinders, the machinist must use his judgment as to where to take this measure from. Set the frames so as to measure an equal distance apart, especially at the jaws. A gauge for this kind of work is shown in Fig. 11. It is made of two pieces of half-inch square steel having two lugs welded on, one piece through which the other piece is free to move, and is held in position by thumb screws in the lugs. This gauge can be used for trying wheels or any such work around a shop. After setting the frames square and in line with the cylinders they may be held in place by braces, as shown in Fig. 10, placed one on each jaw at H and one on each pedestal brace at H. Wedges may be inserted between the frame and boiler to keep it in place, or a device as shown in Fig. 14 may be used, by putting them in the holes in the frame and setting up the set screw against the boiler.

After setting the frames lay a small parallel strip on top of the frame at the back end and scribe a line from it to the boiler. This will serve as a guide and will show if the frames have been moved while fastening in place. Now, before taking down the lines, measure from them to each jaw and note the distance, which will be referred to later on. The lines may be taken down now and the expansion braces fitted on. In putting the caps on the expansion braces leave space enough between the back end of the brace and the cap to allow for the expansion of the boiler. In fitting the deck it should be left standing off from the boiler from five-eighths to seven-eighths inch, for the same reason. The tail bar, back brace, etc., may be put on now. In hanging cylinders and frames the frames should be arranged so that the rivets of the mud ring will be below the bottom rail of the frame instead of against it, as is often the case in this design of boiler. If the mud ring is below the frame, in case it leaks it can be caulked or new rivets put in without moving the frame.

Fig. 5

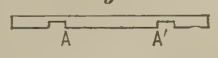


Fig. 6

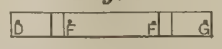


Fig. 7

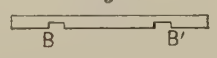


Fig. 8

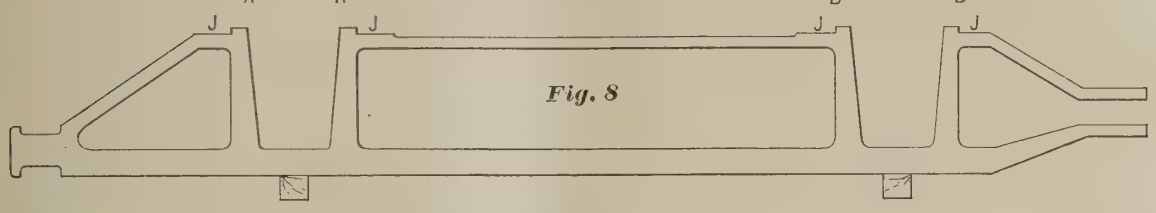


Fig. 9

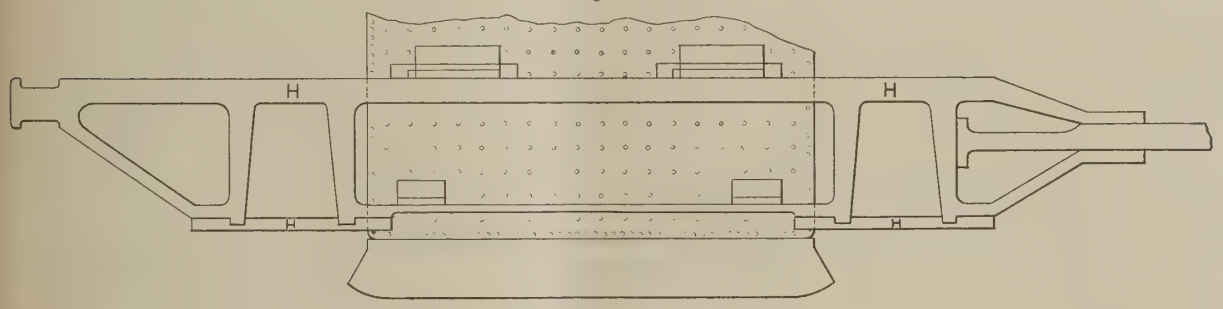


Fig. 10

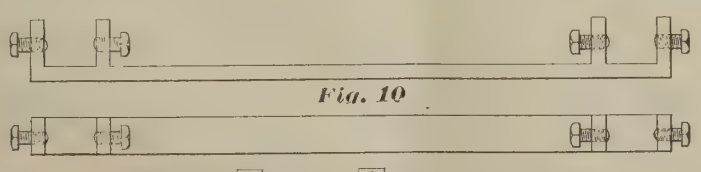


Fig. 11

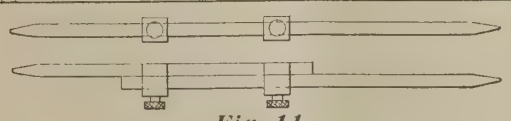


Fig. 12

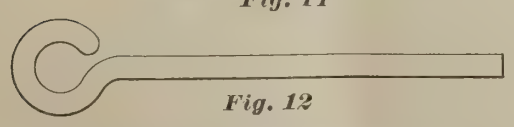


Fig. 13

Fig. 14

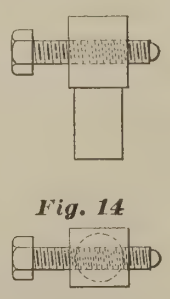


Fig. 15

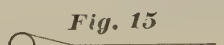


Fig. 16

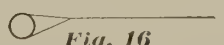
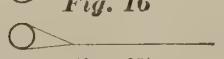


Fig. 17



When Mr. J. M. Toucey, general manager of the New York Central Railroad, was under examination before the New York Board of Aldermen as to the necessity for lighting the Fourth Avenue tunnel by electricity, he explained that the locomotives taking trains out of the Grand Central station started with a heavy fire of coked coal, which was not touched till after the tunnel was passed, and that no smoke was emitted. "No smoke," said one of the aldermen. "Thin phat is awl the clouds I see comin out ave the holes in the tunnel?" "That is the steam," said Mr. Toucey. "Sthame is it," exclaimed another alderman, "it's me-self knows better, for by Jasus I've seen it come out of the smoke stack wid me own eyes."

In regard to the possibility of the brakes hung from the body of a car lifting the wheels off the truck off the track Mr. J. H. Setchel said: I once tried the experiment of jacking up one corner of a truck until the frame was distorted about as much as would occur in practice under the worst conditions, and then setting the brakes. The frame remained in that position when the jack was removed. Now, with air brakes we may sometimes catch a truck when the car body is swaying or when it is in an inclined position on a curve, and hold it so rigidly as to lift some of the wheels off the track when the car body rights itself or sways to the other side, thus casusing a derailment.

Staybolts of Locomotive Boilers.

At the March meeting of the New England Railroad Club an address on staybolts of locomotive boilers was made by Mr. J. N. Lauder.

Mr. Lauder, in opening, adverted to the pressure put on railroad men to move freight and passengers at the lowest possible cost for power. To meet this requirement the most powerful kind of locomotives are necessary, and a high pressure of steam is essential as a means of doing heavy work with the least possible expenditure of fuel. Steam pressures have been gradually increased till 200 pounds is not unusual. To resist this enormous steam tension efficient staybolts is one of the main factors in the problem.

As the boiler of a locomotive has to be carried with the engine, lightness is essential, and there are inconvenient restrictions as to form. Flat surfaces must be employed, and the only way to secure them in shape is with staybolts. Screw staybolts could be put into a boiler that would carry safely almost any pressure, were it not for the expansion of metals under different temperatures; and it is well understood that the cause of broken staybolts is mainly the expansion of the metals. Staybolts near the bottom of the furnace rarely break. They are subjected to the same strains that prevail above that point; but at the bottom of the furnace, near the mud-ring, the two plates forming the furnace, the outside and inside plates, with the pressure between them, are tied solidly by the mud-ring; but differences in temperature between the firebox plate and the outside plate are so little that the two plates expand together, and consequently there is no mechanical bending action brought upon the staybolts at that point. As you get near the top of the furnace, owing to several causes, the inside plates, which are in actual contact with the fire, expand more than the outside plates, which are in contact with the atmosphere; and consequently there is an elongation of the plates on the inside beyond that of those on the outside, and this is continually bringing a bending strain on those screw stays. When the locomotive is worked hard and makes steam rapidly, the inside plates become very hot in comparison with the outside ones, and consequently the inside box goes up, or elongates in a vertical direction, and by that expansion carries one end of the staybolt up. Part of this difference in temperature between the plates is probably due to a defective circulation of water, allowing the inside plate to become very much hotter than if there was always a perfect circulation of water and the water side of the firebox plate always had water against it; but careful observation and experiment show that the circulation of water is to a certain extent defective under those circumstances, and instead of solid water lying against the plates it is saturated steam, probably in some cases almost dry steam, and an undue expansion takes place.

When this bending action of these staybolts takes place they are under high tensile strains; and no matter how soft or ductile the material may be when the bolt is first put in, that continual movement up and down produces the same effect on the staybolts that it produces in a soft copper wire. If you take a piece of soft copper wire and begin to bend it back and forth pretty soon it hardens, and if you continue bending it at that point presently it will snap—it becomes so hardened and brittle by that mechanical movement. The same action takes place to a certain extent in the staybolts. They invariably break close to the outside plate, where the bending strains are concentrated.

As a matter of safety almost every locomotive man now perforates the staybolt from the outside in for the distance of perhaps one inch—far enough to be sure to get beyond the point where the fracture takes place. When the staybolt breaks, that produces a leak, and gives us warning that that bolt is broken, or partially broken off, and it can be removed, but those little holes drilled into the end of that bolt may become clogged up with dirt, grease and other things, and that is not an infallible remedy for the difficulty. I have seen perforated staybolts that were broken off and produced no leak.

The ordinary method of testing a bolt is to hold a sledge on one end of the staybolt and tap it with another on the other end, and an expert boilermaker can determine almost absolutely whether that bolt is broken or not, whether it is entirely broken or not; and that is all he can tell. If there is one-quarter of the surface of a staybolt still unbroken, that test will not tell him that. If it is entirely broken and parted, so that the two surfaces are not in contact, it is an almost infallible test, if the man who makes it is an expert. Mr. Lauder then proceeded to illustrate by means of a defective staybolt how staybolts may be almost broken off and yet be beyond the detection of the most expert inspector.

In regard to staybolts for a boiler carrying 190 pounds of steam Mr. Lauder advocated the use of one-inch stays placed about four inches apart. He did not believe it was safe to depend on the staybolts longer than six years; believed staybolts deteriorated in service and it was necessary to renew them after that time, or at least not longer than eight years.

As to inspection he said: "I know of but one way, and that is holding a sledge on one end of the staybolt, and rapping it with a hammer on the other end, whereby an expert tester will determine almost absolutely whether the bolt is broken or not, but, as I said before, he cannot determine whether it is partially broken, and he cannot tell but that a great many are two-thirds broken off, they being in a position where they cannot be inspected by examination other than in the way I have mentioned.

"As to the best material for staybolts: Most of us will say that we don't care for a metal that is of very high tensile strength, but we want a metal that is very tough and ductile, fibrous, something that will resist the bending strains brought upon it. That would seem to be true, but within a few years I have seen this: A boiler was built with staybolts of Norway iron, so ductile that a bar of it, cold, could be bent over under the hammer and driven down solid without any sign of breaking. It would seem that that was an ideal metal for staybolts. That boiler was put into ordinary service, with 140 pounds pressure, and inside of five years a lot of the staybolts on one side gave way. When those bolts were taken out some of them were as brittle as any piece of cast iron I ever saw. I put one of them into a vise, and with one blow of an ordinary hammer broke off one of the longer stays at the top; then took the balance and annealed it, doubled it down and hammered it down without a fracture. Several years ago a low grade of steel was used for staybolts, on the theory that it was so much stronger than iron and was so ductile. I think it proved to be the worst metal that could possibly be used, breaking sooner than ordinary grades of iron, and so we had to fall back on iron, and the problem is to get iron that will stand for the longest period under the strains to which staybolts are subjected."

Mr. Henry Leach thought that it was very desirable to establish a rule for replacing staybolts based on a fixed period of service. He thought that when the first staybolt broke it was time to renew the whole of those that were located above the frame. He had found the selection of proper material for staybolts a difficult matter, for what might be considered the very best iron for this purpose sometimes did not give such good service as material of inferior quality.

Mr. Angus Sinclair considered that there was a cause and effect connection between the high boiler pressures that have been coming into vogue in the last few years and the numerous explosions of locomotive boilers. He considered that the higher pressures called for not only stronger and better constructed, but they demanded more rigid and systematic inspection.

Mr. J. T. Gordon: In 1885 we purchased a locomotive, and last October the engineer reported that he thought some of the staybolts were broken on one side. On inspection I found that every staybolt from the third row at the bottom to the third row at the top was broken on that side; and on further examination I found the same thing on the other side. These bolts were seven-eighths inch diameter with the exception of the three top rows, which were one inch. The boilermaker got a light hammer and struck some of them, and they were easily broken, being very brittle. He tried some of the top rows which were whole, and knocked them off with four or five blows. The material of which those bolts were made was supposed to be good, as it was bought of one of the best manufacturers in the United States. The boiler pressure had only been 140 pounds, and the engine had run a little over five years. In contracting for a couple of locomotives to carry 175 pounds pressure, I put in a specification for the bolts to be one inch in diameter, and the five top rows to be an inch and one-eighth.

Mr. G. A. Ferguson gave particulars of a case similar to that experienced by Mr. Gordon.

Mr. Lauder: All the testimony we have to-night indicates the importance of testing our staybolts in the best possible way, and a good deal oftener than we have been in the habit of doing. About a year ago I was requested by the Railroad Commissioners of Massachusetts to test our staybolts every quarter and make a report to them. I opposed it as an unnecessary hardship, as it is a very difficult thing to do for a road having several hundred engines in service, but said if they insisted upon it I would do it. We complied with the request, and I have since seen the benefit of it, and wouldn't abandon it to-day under any condition, and if the managers of the Old Colony Railroad should give me an order to-day to discontinue this practice and go back to the old method, I wouldn't obey it; I would sooner resign my position. Anything that we can do to ascertain the condition of our boilers and keep them in safe running order we are bound to do.

To Prevent the Forgery of Defect Cards.

At the Chattanooga meeting of the Southwestern Railroad Club, Mr. A. W. Gibbs, Georgia Central, said:

Our difficulties with forgeries can be best illustrated by supposing the following case: A card is given by a certain road for mixed drawbars in car 1,246 of the A. & B. road. The car goes on, and at some point the card is removed, its car number obliterated as far as possible and a new number, 11,273, put over it. To the defect previously recorded on the card, viz., mixed drawbars, there are then added other defects, sometimes of a very serious nature. The first handwriting on the card is imitated as closely as possible. This card is then put on the car whose number it now bears, and you will readily see that the card bears the signature and writing of the inspector who issued it. Finally the repairs are made, and the bill comes in and the railroad company who issued the card find that they have no record of car 11,273 having been on their line, or having been carded at that date or for those defects. You will readily see that they have no means of tracing this forged card, and finding that it really was their card placed on car 1,246 for mixed drawbars only. It is true that it might be possible to trace the car back through the route which it had traversed and get enough evidence to prove that the card was a forgery. It is almost impossible, however, to get all the information one would desire. We have traced several cars in this manner. When, however, we are convinced from the appearance of the card that it is a forgery we simply refuse to pay the bill without any further investigation. I have suggested as a remedy for this condition of affairs that the cards be printed with stubs attached and the whole bound in book form. These books would then be given to inspectors, and the first book, for instance, would have the cards and stubs numbered consecutively from 1 to 50, the second book 51 to 100, and so on. When the card is made out the stub should also be filled in and then, if at a later period card 56 was issued (to use the same illustration) for car 1,246 of the A. & B. road, comes back to us with car number 11,273 upon it, and several defects added to those first written in, we cannot only say that the card is a forgery, but we can prove just exactly what it was first made out for.

Mr. W. H. Thomas proposed that the practice should be adopted of drawing lines over the blank space on cards to prevent anything from being added to the original notification.

Mr. Cullen said that they kept an accurate record of all defect cards issued, and they used this as a check upon those who added to cards.

Mr. Leeds made a motion that inspectors be instructed to deface the blank portion of cards, to prevent forgeries from being imposed upon them. The motion was carried.

An American Superintendent on British Railways.

At the February meeting of the Northwestern Railroad Club Mr. W. A. Scott, general superintendent of the Chicago, St. Paul, Minneapolis & Omaha, gave an interesting talk on his recent trip to Europe.

Although a great deal is said in this country about the performance of compound locomotives in Europe, he found that they were used on only two railroads in England, the London & Northwestern, where Mr. Webb's three-cylinder type of engine is used, and on the Northeastern Railway, where Mr. Worsdell's two-cylinder compound is used; was struck with the lightness of the trains run and the long stretches they made without stopping or shutting off steam; did not think that the light character of the work done was calculated to show compound locomotives to the best advantage. When he compared American trains with those usually hauled in Britain, he did not think there was much difference in the fuel required to do a certain amount of work.

Speaking of the Worsdell compounds, he said: "The intercepting valve and appurtenances seem complicated as I describe it, but when looked at is more simple; and one can readily believe, on viewing it, that an ingenious method has been devised to subserve the purpose of starting. I think, however, that it will be improved upon in time, and a yet more simple method found to conduct the necessary quantity of live steam to the low-pressure cylinder to get the engine into motion. These two-cylinder compound engines struck me as preferable to those of three-cylinder type, and it is my judgment that builders will in time be able to work out that plan with more beneficial results than any other now known, and am glad to see that the Schenectady Locomotive Works are laboring in that direction. Mr. Worsdell uses most of his compounds with two pairs of drivers coupled, and 7-feet and 7-feet 6-inch drivers for his fast passenger trains.

"We in this country are vitally interested in any device that will save fuel, and I firmly believe that for heavy passenger and freight trains much economy in that direction will in time be had by the use of a two-cylinder compound engine with some more simple device for the necessary entrance of live steam in low-pressure cylinder for starting purposes, an all-important point for American railways, where so many stops have to be made, even with our first class passenger trains.

"Locomotive men in that country have also been educated, as a rule, to greater habits of economy in working and firing their engines, or possibly they follow instructions closer than those on American lines; each of them appearing to be as anxious to save fuel and unnecessary wear and tear of their machines as their responsible officers. But little black smoke was discernible, and that result was obtained more by continuous light firing and close adjustment of cut-off than from any combustion devices that came under my observation. Neither did I see engines continually blowing off steam, which to my mind is always an indication of carelessness and waste of fuel on the part of the enginemen. The engineer as well as the fireman paid close attention to the proper admittance of air to the furnace, and dampers were well regulated to govern it. Instructions and suggestions of locomotive superintendents and other officers were duly regarded by men assigned to engines, every one of them appearing to remember that it takes money to produce steam."

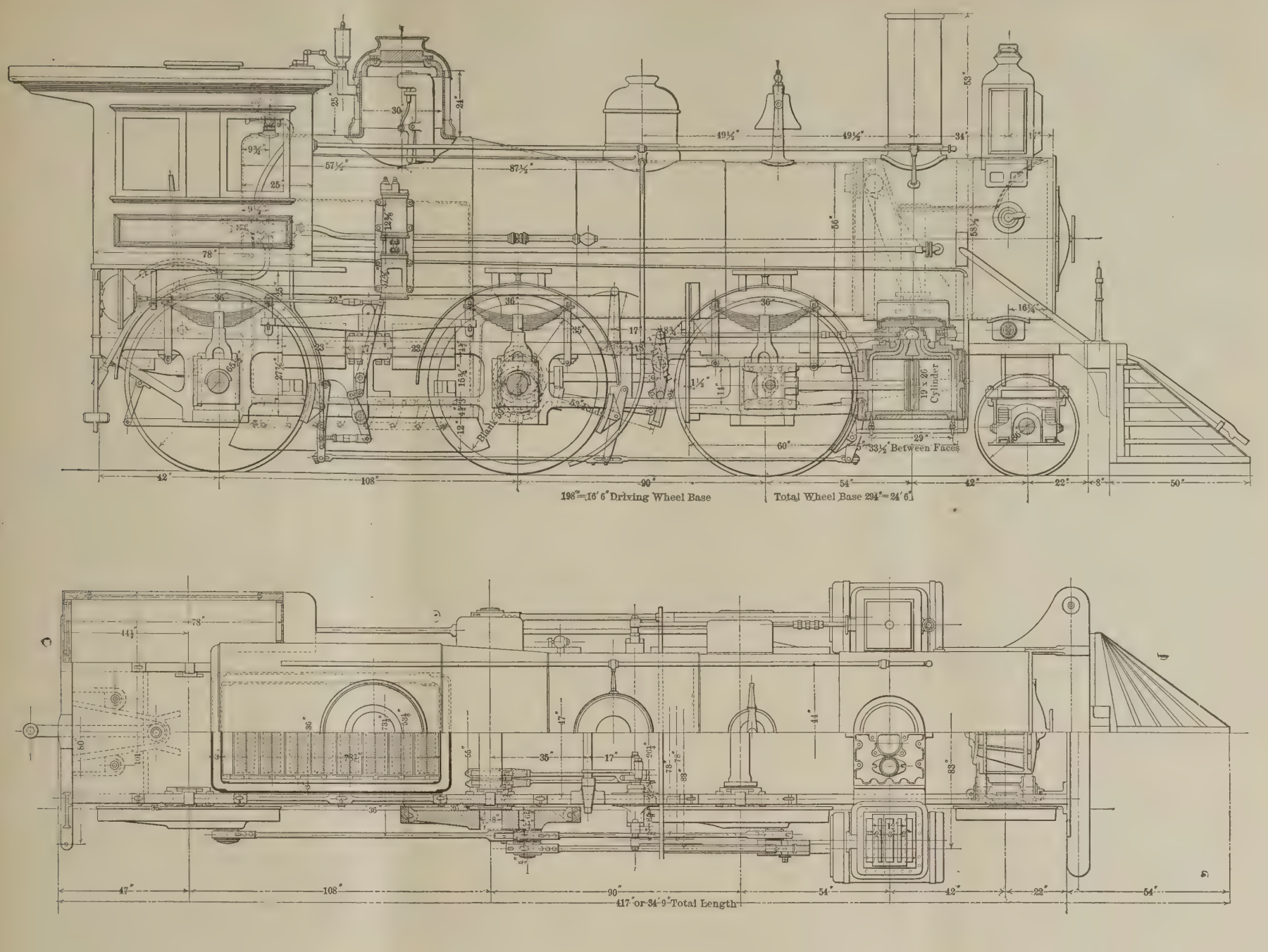
Where Oak is Cheap.

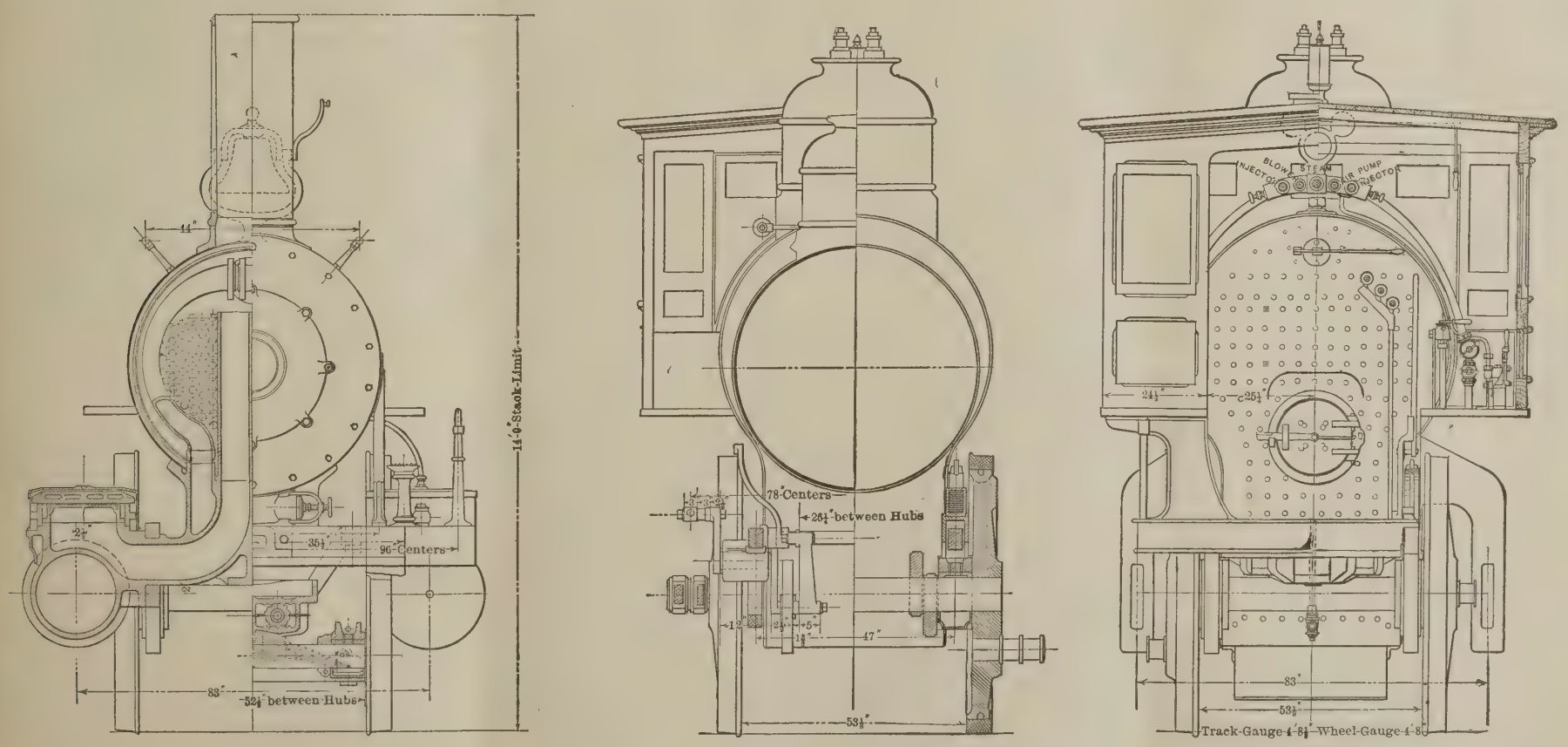
Railroad car builders are constantly complaining about the scarcity of good oak for construction purposes; but there are many tracks of fine oak timber in different parts of the country still untouched by the axe of the wood chopper. The truth of this was recently brought home to the freight agent of a new railroad opened in Kentucky, who went out on the line to canvass for business. He found a farmer who had 1,000 acres of woodland which he reserved for hunting purposes. The woodland was in a solid block and timbered heavily with very choice oak, most of it second growth and large. The freight agent, out of curiosity, asked the farmer what he would sell his timbered land for. The farmer expressed a reluctance to sell, but said that if his visitor wanted to locate down that way there would be no difficulty in buying 1,000 or 2,000 acres of timbered land, principally oak, as good as his own, in that immediate vicinity, but that if the stranger could not find what he wanted, he might consent to let, say, 500 acres of his go. "But the price will be pretty steep, sah,' said the planter in conclusion.

"I can't promise you I will buy, but I would like to get some idea of values," observed the railroad man.

"The land is as good as you will find anywhere in Kentucky, and I would want $15 an acre for it anyway," said the planter; and as he spoke he looked at his visitor to see how the proposition struck him.

The railroad man, in telling of his experience, declared there were hundreds of trees in the tract, each one of which had a greater market value than the planter placed on his property by the acre.





MAINE CENTRAL MOGUL LOCOMOTIVE.

Annexed we show several line sectional cuts and in a leaf supplement will be found a perspective wood cut of a very efficient mogul locomotive, designed by Mr. Amos Pilsbury, general master mechanic of the Maine Central Railroad. Several of these engines were built at the Portland Locomotive Works, and they are used very successfully both on passenger and freight trains. Writing about the engines Mr. Pilsbury says ;

We have two which are now run on our night Pullman trains, where they are giving much better satisfaction than any class of engines we have ever used. These trains are very heavy, especially during the summer season, consisting then of from 12 to 14 cars; two baggage, one mail, one express, one smoker, five Pullman sleepers and from two to four passenger cars. Before putting on the moguls we ran 18 × 24-inch American type engines on those trains. The trains stop at all stations, and they sometimes troubled us in starting. Since the mogul engines were put on we have overcome that trouble, and have no difficulty in starting trains without taking slack at any point on our main line under favorable circumstances.

In leaving Bangor, going west, we have a grade of 45 feet to the mile for nine miles, and you can judge something of the performance of an engine when hauling 12 or 14 heavy cars. You will, perhaps, remember something about the grade from Winslow to Waterville, going east, where for about two miles the grade is 66 feet per mile on reverse curves. We have four of the mogul engines in service, two running on the trains above mentioned and two hauling our heavy White Mountain trains on the Portland & Ogdensburg Division during the summer. In winter they haul freight, although hardly adapted for that service on account of the wheels. There we have the heaviest grade on the Maine Central system. Going up the mountain from Bartlett we have a grade nine miles in length with a rise of 116 feet per mile. On that grade from five to seven cars

(according to conditions) are the limit for mogul engines on passenger trains. As you will notice by specifications sent you, the driving wheels are 65½ inches outside diameter with a 59-inch wheel center. Experience has taught me that in building mogul engines for service on mountain divisions a 56-inch wheel center or a 62-inch wheel should be used for passenger service and a 48-inch or 50-inch wheel center for freight service.

A noticeable thing about the engine is the even distribution of the weight on the wheels. The total weight is 110,000 pounds, of which the truck takes 15,000 pounds and the drivers 95,000 pounds, the latter weight being almost equally divided between the three pairs of drivers. The cylinders are 19 × 26 inches, and the drivers 65½ inches outside diameter, which gives the engine a little over 143 pounds of rotative power for every effective pound of steam pressure in the cylinders. The engine carries 160 pounds of steam to the square inch. According to the Railway Master Mechanics' Association rule, this gives 4.3 as the coefficient adhesion.

The boiler is 56 inches diameter with wagon top and the crown sheet of firebox secured by crown bars, the outside sheet and dome being also re-enforced at various points by strong stays. The outside shell of the boiler is of ½-inch Otis steel, except the throat sheet, which is ⅝ inch thick. The firebox is 78 inches long and 35½ inches wide inside; there are 3-inch water spaces at the back and sides, and that in front is 4 inches wide. The stay bolts are 1 inch diameter, set 4 inches from center to center. The four upper rows are drilled through the plate with safety holes. Two Ashton safety valves are used, one being muffled and the other an open pop valve. Water is fed by two Mack injectors.

The steam ports are 16 × 1¼ inches, and the exhaust port is 3 inches wide. Richardson balanced valves are used. It will be noticed that the bearings are all unusually large and that the different working parts are designed to combine the necessary strength with lightness. The engine is in every respect highly creditable to the care and judgment of the designer.

Work Done on American Railroads.

It takes a long time for the Interstate Railroad Commissioners to get out their statistics of railroad operating, but the facts collected are highly reliable and therefore valuable. According to a report recently issued, there were in 1889 1,705 railroad organizations in the United States. Of those 609 were independent roads, 472 roads subordinate to other companies, and 148 owned by private individuals, the balance being small lines, feeders to great systems. The mileage operated is reported at 153,385.37. The number of men employed is 704,743, showing that 459 men are employed for every 100 miles of line. This shows greater efficiency as regards the amount of work done than is attained on foreign roads. For example, comparison in this particular is made with England, where there are 346,426 men employed, which gives 1,748 men for every 100 miles of line. The efficiency of the men employed on American railways is shown by the fact that each engineer has carried what is equivalent to 2,274,455 tons of freight one mile and 382,362 passengers one mile. The total number of passengers carried by rail in the United States was 472,171,343 and each passenger traveled on the average 24.47 miles. This shows a total passenger mileage of 11,553,820,445. The total number of tons of freight carried was 539,639,583; the average haul for each ton of freight was 127.36 miles, showing a ton mileage of 68,727,223,146. If the number of miles traveled is divided equally among the inhabitants of the United States each inhabitant would have traveled 175.5 ‹, or if the amount of freight carried should be equally divided among the inhabitants of the United States it would appear that 1,041.32 tons of freight would have been carried one mile for each person.

RAILROAD EQUIPMENT.

The total equipment of railways is 29,036 locomotives, of which 8,079 are passenger and 15,140 are freight locomotives; 7,706 passenger locomotives and 8,743 freight locomotives are fitted with automatic train brakes. There are 961,119 cars used, of which 25,665 are in the passenger service and 854,031 in the freight service; 23,540 passenger cars and 66,513 freight cars are fitted with the automatic train brake; 23,348 passenger cars and 46,644 freight cars are fitted with the automatic coupler. The automatic couplers in use are 80.510. These couplers are of 39 different styles. The analysis of equipment shows that there are on the average 19 engines per 100 miles of line; that there are 557 freight cars per 100 miles of line, and 17 passenger cars per 100 miles of line. It shows further that the ton miles accomplished during the year are, for a freight engine, 4,528,786, and that the passenger miles accomplished by a passenger engine in a year are 1,430,105.

KILLED AND WOUNDED.

The statistics of accidents show that during the year covered by the report 310 passengers have been killed and 2,146 passengers injured. This shows that one passenger has been killed in every 1,523,133 passengers carried, and one passenger injured in every 220,024 passengers carried. The corresponding rate in England for the year 1888 is one passenger killed for every 6,942,336 carried, and one passenger injured for every 527,577 carried. This discrepancy may, perhaps, be explained by the fact that the number of miles traveled per ticket is in this country much greater than in England, and also by the fact that English roads employ more men in proportion to the number of passengers carried than do American roads. Of employés in the United States 1,972 have been killed and 20,028 injured during the year. These figures show that one death occurs for every 357, and one injury for every 35 employés. If a similar statement be made for trainmen alone, one death occurs for every 117 and an injury for every 12 men employed.

Improved Engine Truck Oil-box Cellar.

At a meeting of the Northwestern Railroad Club, Mr. Wm. McIntosh, speaking of the difficulties of keeping engine trucks properly lubricated, said: The locomotive truck box of to-day is substantially what it was fifty years ago. Oil is poured upon waste in a cavity on top of the box, and is supposed to reach the journal through holes in the box and brass. I say "supposed," for in fact but little of the oil ever reaches its destination. It naturally follows the walk of the hole in its downward course and escapes between the box and top of brass. When the box is new and the brass full size, fairly good lubrication is obtained from the packing. But as the brass wears, the box drops and carries the cellar with it until there is nearly an inch of space between the journal and cellar. The cellar-bolts also wear the holes in the lugs of box oblong, which is not surprising considering that the cellars weigh from 15 to 20 pounds, with packing.

I have tried various ways to overcome this trouble, and I have finally developed a plan to support the cellar on spring-seated yokes arranged for required adjustment. This dispenses with the heavy cast-iron cellar, and permits the use of one made of light sheet-iron (or preferably pressed steel), weighing less than five pounds, with packing. These cellars can be applied to the ordinary engine truck box at little expense, and when once in place are securely locked and will last indefinitely. I am also using a simple device for conveying oil from a cup conveniently located on engine frame, through a flexible tube direct to the journal, instead of depositing it on the waste on top of the box. An engine thus equipped may be run continuously without other care than an occasional filling of the cups, and with absolute freedom from heating, and effect a saving of at least 75 per cent. in oil.

Pressed Steel in Car Construction.

At the March meeting of the New York Railroad Club Mr. Chas. T. Schoen read a paper on the above subject, of which the following is a comprehensive abstract:

From the best information that I can gather I estimate that about 12,000 tons of pressed steel has gone into car construction during the past 2½ years, consisting of spring plates, journal box lids, center plates, stake pockets, side bearings, drawbar attachments, dead blocks, corner bands, etc., and from all that I can learn these various articles are doing good service.

The greatest drawback to the introduction of the various articles is the multitudinous number of sizes of the same article, the impossibility of getting the gentlemen constituting the mechanical departments to see eye to eye in the matter of standards. As one of them said to me a few days ago while going through our works: "We meet in convention, discuss and adopt standards, then go home and keep on doing as we please." As an illustration of this, the Schoen Manufacturing Company has between 70 and 80 sets of dies for center plates, and about 100 sets of dies for stake pockets alone. There ought not to be any necessity for more than one-half dozen sizes of either of these articles. This same difficulty follows in nearly everything about a car, and it is readily seen that the various articles cannot be produced as cheaply as they could if this large expense for dies was eliminated from the cost. Besides, the cost for repairs is largely increased because of the delays occasioned in getting material for repairs for foreign cars having different patterns. You are all, of course, familiar with this trouble in the present practice in patterns for cast iron, and this knowledge should influence you very favorably toward the adoption of standards in pressed steel in its early stages, thus avoiding what in the future would be a constant source of expense, as is now the case in the old practice.

The advantage of using a homogeneous metal in car construction, such as we have in low carbon steel, is certainly beyond comparison with cast iron. We have a metal that will withstand shocks without injury far beyond that of cast iron, and in consequence of this the expense for repairs is largely decreased.

The weight of the various articles in pressed steel, which are substituted for castings, will average about one-third the weight of the cast iron displaced, and assuming that there have been 12,000 tons of pressed steel articles used up to the present time, as stated above, it has displaced 36,000 tons of cast iron. Deduct the weight of the steel (12,000 tons), and we have a net saving of 24,000 tons of dead weight. It costs just as much to haul that 24,000 tons of surplus weight as it does to haul that amount of paying freight.

I predict in the near future that a steel car throughout will be the popular car. The cost of steel is growing less from year to year, brought about by improved methods of manufacture, until even now a steel car can be built very closely approximating the cost of a first-class wooden car as at present constructed. The Harvey Steel Car Company, of Chicago, I understand, is at present engaged in building twenty-five of its steel cars. The Fox Pressed Steel Company is engaged in developing its pressed steel car truck, and has the utmost faith in its success. The Schoen Manufacturing Company is at present engaged in making preparations to build a number of steel cars, and proposes to put them in service and let them run and develop any possible weak points, or mistakes in design, with a view of preparing to build these cars in a regular way. It is confidently believed that a steel gondola car of 30 tons capacity can be built thoroughly well, and the weight will be less than 19,000 pounds. This is a saving in dead weight of several thousand pounds over the ordinary wooden car; and as a vehicle for the transportation of freight its value is as much greater than a wooden car as the cost of transporting the dead weight in the wooden car would amount to, less any differences that there might be in expense of keeping the car in repair; and it is fair to presume that the cost for maintenance would be less than it would be in a wooden car.

The constant reduction in cost of steel, and the growing scarcity and consequent increase in cost of timber, the reduction in dead weight, the probability that they will last twice as long as a wooden car, are most certainly strong reasons why all developments looking to the introduction of a steel car, either in whole or in part, should and will be viewed with more than ordinary interest by railroad men and investors in railroad securities, and it is to be hoped that the committee appointed at the last Master Car Builders' Convention to look into and report on this question will furnish some valuable information on the subject.

The art of shaping steel in dies is a very interesting study. Many things can be made from pressed steel of considerable thickness that the ordinary worker of metal would hardly credit. This is due to the developments in the art, partly, and partly to the uniformity in quality and cheapness of the steel as produced to-day. A few years ago this industry could not have been developed because of the high cost of material. To-day, however, steel shapes can be substituted for castings without increasing the cost of construction, except in cases where extremely light castings are used.

Car Heating Test.

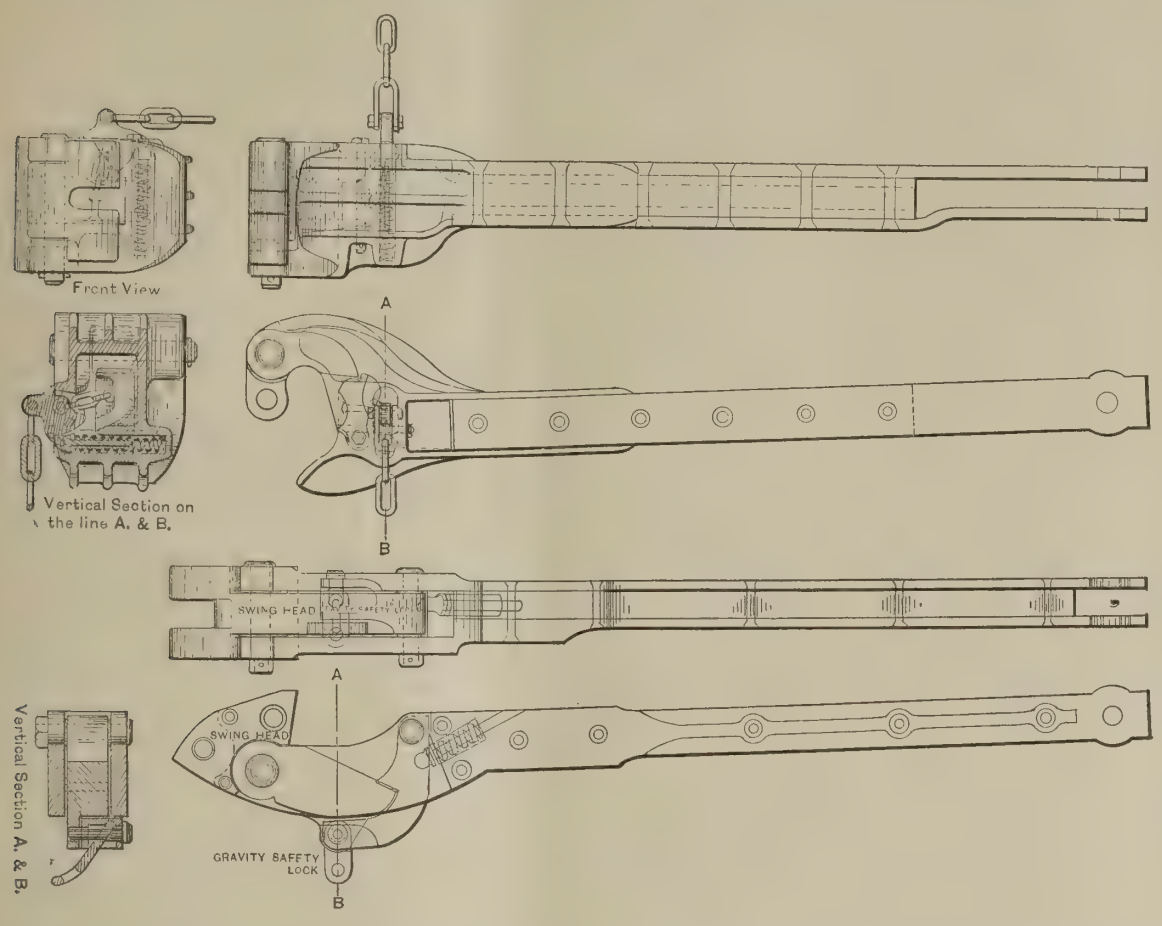
The truth of the saying that it is an ill wind that blows nobody good was proved to the entire satisfaction of the Consolidated Car Heating Company last month. The fierce weather of the early March weeks, which inflicted sickness and discomfort upon people generally, gave the company named an excellent opportunity to exhibit to good advantage the working of their car-heating system before a host of railroad men and other interested parties. An invitation had been sent out to the leading railroad men in the country to come to Albany, N. Y., on March 11 and 12 and ride on trains of the Delaware & Hudson Canal belt line in cars heated by the company's system of heating, and a large number of general managers, master mechanics and car builders responded. The company are the proprietors of several different patented methods of heating cars, but the system on exhibition was the co-mingler plan, in which water heated by steam from the locomotive warms the cars. An interesting feature of the exhibit was the working of the thermostat which regulates the temperature of the car. The instrument used for this purpose is a hollow, flexible disk filled with a liquid that has a high measure of expansion and contraction under change of temperature. The resulting movement is used for operating simple connections that open and close the steam valve in the heater pipes, thereby regulating the temperature in the car. This was done remarkably well. Although the weather was cold and windy and there was a great deal of opening and closing doors, the temperature inside the cars did not vary more than two degrees. While in this neighborhood we took the opportunity to ride in several trains that were not on exhibition, and found that the temperature inside of them was as well regulated as it was in the trains that carried the visitors.

Perfect Engines.

Permitted by the management of the White Star Line to inspect the engines of the steamer "Teutonic" at work, I felt that for once I was able to see effective power thoroughly well applied—watching the uninterrupted revolutions of two large shafts, each cranked for high, intermediate, and low pressure cylinders of nearly 12,000 horse power, which were put in motion at New York dock and ceaselessly kept up a speed of from 20 to 24 miles per hour night and day, their continual thump thrusting the magnificent steamer —with 16,000 tons water displacement and an immense load—which never ceased to move until the Mersey was reached and we found ourselves at Liverpool. Neither engine stopped one moment from the time it left one continent until it reached the other; and through calm and storm every reflective passenger realized that there were beating beneath him machinery of an exceptionally superior character. The finish of these engines and the working of every part were admirable, and while moving in a storm, with the bow at times plunged under water, it astonished me to discover how thoroughly they were automatically governed. It had occurred to me that, with such power applied to shafts, if wheels should suddenly come even partially to the surface they must necessarily tear everything to pieces. In the first storm plunges I watched this with interest, and found that aside from a momentary flutter there was nothing to indicate a change until the wheels were again submerged, when with one powerful push we found ourselves again in normal position and power working as harmoniously as before.—*W. A. Scott, at Northwestern Railway Club.*

Improved Passenger Car Drawbars.

Annexed engravings illustrate the Bissell & Bergman wrought iron car coupler used by the Wagner Palace Car Company and the Gould gravity lock car coupler, adapted for use on the Miller platform and interchangeable with the Miller, Cowell and the Bissell & Bergman drawbars. These improvements have been the means of effecting great saving of time and expense for sleeping car companies and



others. Before this invention was perfected it was necessary to make a Janney-Miller platform at a cost of about $250 a car. In addition to the direct expense the company were deprived of the use of the car for about ten days. Now one platform can be used for both types of couplers and the change can be made in five minutes.

Demand for Lumber.

There is a growing demand from the railroad companies for materials to be used in repairing rolling stock as well as road beds. During the past two years the railroads have done as little in the way of improvements and repairing as circumstances would admit, and they are now forced to the alternative of making repairs all around.

Some of the roads will avoid investments of this character as long as possible, but there is a demand cropping out here and there which indicates that large supplies of car roofing, car decking and similar materials will be wanted in the next two months. An order was turned in to Chicago this week for 50,000 feet of cypress for car roofing purposes, but dry stock was not at hand nor immediately available, and the order was turned away.

It is a fact that cypress producers have some difficulty in getting their lumber dry enough; the demand has been so active during the past year as to take the lumber without the age necessary to put it into the most desirable shape for factory purposes, and now that the railroad companies are taking hold of this material with a vim, the producers will be able, to some extent, to be independent about the disposition of their lumber.—*Timberman.*

Work in Chicago & Northwestern Shops.

A new floor is being laid in the machine shop at the West Chicago Shops, which, considering that the shop is 550 feet long by 120 feet wide, is quite an expensive operation under the most favorable conditions, but is rendered doubly so on account of being hampered by locomotives and the numerous tools in the shop that must be handled to admit of doing this work.

A new 60-ton locomotive crane is also being erected in this shop, to be used for raising engines off their wheels and lowering them again, and is capable of lifting 300 tons or raising the heaviest engine one foot per minute, which work is done by a pair of double engines overhead. When the wheels are removed, two pairs of smaller trucks will be run under the engine, which will then be placed upon the transfer table and thereafter assigned to whatever stall desired.

A system of sewerage is also being established in the shop, so that engines can hereafter be washed out in the machine shop without being obliged to go to the roundhouse for that purpose.

A series of pipes is also being laid for the purpose of testing boilers, and are so arranged that this operation can be performed at any point in the shop.

The Most Effective Braking Point.

It is a well known fact that as soon as the wheels are subjected to a brake pressure that allows them to revolve and yet brings them to a point where they are just about to skid the greater retardation of the car is obtained. In other words, the car will stop in a shorter distance with the wheels rolling than when they are sliding.

The reason for this lies in the fact that when the wheel is rolling there is no motion between the wheel and the rail, for the bottom of the wheel is standing still. But when the wheel begins to slide the motion between it and the rail is equal to that of the car.

When we consider the fact that the friction between two bodies at rest is invariably greater than when there is motion between, sometimes amounting to as much as 50 per cent., we can easily see why the skidding wheel offers less resistance to the motion of the train. When the wheel is rolling the brake can be applied up to a point but a fraction below the frictional resistance of the wheel sliding upon the rail, and a corresponding retardation be obtained, while as soon as the wheel begins to slide the retardation drops instantly to the frictional resistance between the wheel and rail in motion.

It is for the same reason that an engine can haul a heavier train than it can start. The coefficient of friction of the journals at rest is greater than that of the same journals in motion; so that the pull required to start a car is greater than that needed to keep it in motion.

Advertising Under Compulsion.

There are men connected with a good many railroads who annually publish a map or guide, or some other pamphlet, respecting the railroad they belong to, and by the aid, direct or indirect, of some important officer, obtain advertisements for the publication by means that are very little short of blackmail. Their victims are almost entirely railroad supply manufacturers, who are given to understand that if they do not advertise, it will be the worse for them. People who purchase railway supplies do not look up illustrated time folders or descriptions of pleasure resorts for the addresses of houses handling the goods they want, and it is doubtful if a single dollar of return was ever obtained from advertising in such publications. Those who consent to insert the advertisements and pay for them understand that the whole thing is an imposition, but they good-naturedly yield rather than risk making enemies who might have the power to interfere with their business. We thought the practice of soliciting supply men for eleemosynary advertisements was on the wane, but a friend has directed our attention to one of the worst specimens we have ever seen, and from no less an important road than the New York Central. Mr. Geo. H. Daniels, general passenger agent of that company, has sent out, about a month ago, on paper bearing the impress of the corporation, letters to the leading manufacturers of railroad supplies begging them for an advertisement for their Summer Tourists' Guide. The New York Central Railroad Company is going into infinitely small business when they permit the chief of a great department to solicit advertisements as a means of helping to defray the expense of their own legitimate advertising. It would be a good plan for the officers who are over Mr. Daniels to ascertain just how much of the money collected under this scheme goes into the pockets of those helping to work it up.

Running a Railroad by Proverbs.

The Baltimore & Ohio has for some time been pushing to the front as a progressive corporation; but there was a time when the authorities in charge lived on their past success, and insisted that the practices and the appliances that raised the road to glory and prosperity were good enough for all time. As the human machines wore out it came to pass that a new superintendent of machinery had to be hired. The taking on of a new man was a momentous event that called for the most serious consideration. After numerous interviews with a variety of high dignitaries a superintendent was hired from another road. Before taking charge he was ushered into the august presence of the president for initiation into the mysteries that guided the fortunes of the company.

Among other doughty lumps of railroad wisdom that fell from the president, he said: There are several mottoes which all Baltimore & Ohio officers are expected to cherish and foster. The first one is make haste slowly, the second is never throw away anything that may be made useful, and the third is let well enough alone.

When the new superintendent of motive power got properly into harness he found that the proverbial philosophy was the strongest influence encountered. It pervaded the system from center to circumference and stood in the way of many necessary changes. After enduring for a few months the inconvenience of using antiquated machinery, he decided to venture on a move out of the beaten path, so he sent notice to whom it might concern among his superiors that he had decided to send 29 camel locomotives to be rebuilt by passing through the furnace of the company's iron mill. Eleven months afterward he received a letter asking on what authority the engines were rebuilt in the original fashion intimated. He answered that the decision had been come to on the basis of a motto which he considered had a right to a place in the counsels of the company. Seven months afterward he received another letter asking what the motto was. He turned up the corner and wrote "Silence gives consent," and he never heard anything further on the subject.

The Ghost Train.

The New York and New England are running between New York and Boston a seven car train which, owing to the appearance of the cars, is called the "white train." The interior of the coaches and parlor cars is finished in highly polished mahogany and all the upholstering is done in a brown tint that harmonizes well with the color of the wood. The smoking car is for the use of those riding in the coaches; and for the patrons of the parlor cars the "royal smoker" is arranged. Half of this car is used for the transportation of baggage, and the remainder is fitted up with the same elegance that is displayed in the finishings of the parlor cars.

Unusually large windows, heavy plate glass mirrors, bookcases, closets and an elaborate oak writing desk are among the conveniences placed in the cars. Twenty parlor chairs and six willow reclining chairs are in each parlor car, and all modern conveniences have been put in everywhere that they could be of use. Pintsch lighting illuminate the cars, the platforms also having lights under the roof. The cars are fitted with air signals and the quick-acting Westinghouse brake. The name popularly given to the train along the line is the "ghost train."

In one of the old Erie shops in Jersey City, once upon a time, there was an old lathe with which nobody could do anything. It wouldn't make good ovals, and nothing round could be turned on it. There are many such old traps in the world, and it is a wonder they are allowed to take up floor space. This one, however, had an excuse. There was an old man who knew that lathe. And it seemed that the lathe knew him; for it would do under his persuasions what it would not do for any other man in the shop. He would put a wedge here and another there, set the tool at just such a peculiar angle, and then he would go ahead and turn up bolts or rods, cut screws on a pinch, or anything else that might be wanted. The lathe would chew and yaw and wabble, but he had things so arranged that the result obtained was all right. He would throw off the belt, and the next man would try his hand at the old thing. The result would be a piece of work which looked like a cross between a "hex" and a half round. No one knew what the machine was tolerated for, nor why a new one was not put in its place. But, as there was nothing better, the old man made the best of a bad bargain, and learned to do work on it.

Bradford McGregor, a mechanical expert of Cincinnati, has succeeded, after numerous experiments, in uniting aluminum with glass, and he claims to be the first who has done so. A large piece of the aluminum with a glass tube in the center was turned in his lathe, and it was impossible to detect the slightlest flaw or joint where they came together; in fact it appeared as one solid mass. Heretofore no metal could be made to unite with glass in which the contraction and expansion were the same, and it is claimed this will create a revolution in the way of reducing the cost of incandescent lights, as it will take the place of platinum, which costs $320 a pound, while the new discovery will not cost $10

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

WASHING OUT LOCOMOTIVE BOILERS.

It would be a hard matter to write anything about the washing out of locomotive boilers that has not been over and over again passed through printers' ink, yet there are many men still in charge of locomotives who do not appear to realize that injury can be done to boilers by carelessness in washing out. The great majority of master mechanics and of round-house foremen would be furious if they saw a boiler washer blow the hot water and steam off the boiler of a locomotive newly in from a run and begin rushing cold water upon the hot sheets and tubes. The men who permit a practice of that kind do not realize the injury being inflicted upon the boiler, and they certainly cannot be familiar with the views on this subject repeatedly expressed in reports of the Railway Master Mechanics' Association. Unfortunately, there are still a rapidly diminishing number of master mechanics in charge of motive power who never read anything, and it must have been under a representative of this class that we lately saw a boiler washer blowing off the water of a locomotive under steam and then applying the hose under a strong head of cold water. Inquiry surprised us with the information that the practice is still quite common in some quarters.

When cold water is forced in this manner upon the hot surfaces inside a boiler, it is almost certain to do injury that may not be immediately apparent, but is sure to appear in some form of weakness later on. Good mild steel would not suffer from the sudden change of temperature between the boiling heat and that of cold water if it were permitted to contract evenly, but the water is applied in spots inside of a boiler, and the sudden contraction of a part of a sheet tends to start small cracks that become open fractures in course of time. The thing is not unknown of a fire-box sheet cracking throughout its whole length when cold water has been suddenly applied.

The danger of injuring sheets and stay bolts ought to be sufficient reason for preventing people from blowing off boilers and then applying cold water, but there are even greater objections to the practice. The inside of the boiler is so hot when the steam and water are first blown off that the mud and sediment from the water bakes on to the heating surfaces in the form of a crust that hardens so that it cannot be washed out, and as every blowing-off takes place a new coating of scale is put above the old one till a thick crust is formed. There is no more expeditious way of covering the heating surfaces of a boiler with thick scale than by blowing off the water and steam together before washing out. This evil follows even when the boiler is permitted to cool before cold water is applied, after being blown off. Some men try to justify the practice of blowing off a boiler hot, on the grounds that the rush of water toward the blow-off cock carries large quantities of mud with it. This may be the case, but it also leaves accumulations of mud that harden under the heat and stick so enaciously that the washing-out water fails to move them. The rush of water that induces a movement of all the mud inside of a boiler should be caused by the hose forcing in a strong stream. The mud-burned locomotive boilers to be found all over the country are very numerous, and in most cases the injury is inflicted through defective methods of washing out. The durabilty of a boiler is so much dependent upon proper means being provided for washing out the mud and scale that it might be supposed all designers would be fully impressed with the importance of the matter. They are not so by any means. We lately examined the designs in a locomotive shop of boilers sent out from a railroad drawing office, and there were no wash-out plugs in the front part of the fire-box, and no provision was made for reaching the crown of the fire-box with water, although the railroad traversed a region noted for bad water. There is too great a tendency among draughtsmen to regard provisions for washing out boilers as unimportant details, when they are really essential to the safety, economy and durabilty of the boiler. The planning of easy and efficient means for reaching every point inside of a boiler with an unbroken stream of washing-out water is of much greater consequence than numerous other fanciful purposes to which designers devote pains-taking attention. If more thought were bestowed upon this detail of locomotive designing, there would be fewer wash-out plugs set behind braces and other obstructions to the movement of a wrench, the water from hose nozzles would more readily find its goal among mud and scale deposits, and the men washing out boilers would be encouraged to do their work with more thoroughness.

Given free and easy access to all parts of a boiler and a good head of water, and there will be no trouble with mud deposits, and the destructive effects of incrustation will be greatly diminished. We are in full sympathy with the work of those who are striving to invent appliances for purifying feed water and for preventing the deposit of scale-forming ingredients on the heating surfaces of boilers, but we believe that greater attention ought to be devoted to providing the means of washing out properly. If this were done there would be less necessity for feed water purifiers. It is the better way to permit a boiler to cool down with the water inside before beginning to wash out. Then the sediment is all soft and can be readily washed out if the water be forced in properly. As the demand for engines prevents this deliberate method from being followed in many roundhouses, nearly the same results can be secured by blowing off the steam, then applying the hose and letting the water escape from the blow-off cock or wash-out plug as fast as the hose puts in a fresh supply. By this plan the cooling is gradually accomplished and there is no baking of mud or cracking of hot plates. This is the practice followed in all sensibly managed engine houses where washing out must be done quickly. Some men responsible for the care and maintenance of locomotives regard the washing out of boilers as a matter not worthy of their personal attention. When this is the case the work is likely to be neglected, with the consequence of increase in the consumption of fuel, increase in the expense for repairs, and increase of danger of boiler explosions.

PRIVATE CARS.

When the Gould interests obtained control of the Union Pacific a trenchant reduction of the private cars in use by the officers of the company was one of the first reforms introduced showing unmistakable signs that a change of management had taken place. Western men used to joke that every man above the rank of track laborer was entitled to the use of a private car during the Adams régime. Although this exaggeration was based on Western ideas of magnitude, it is undeniable that the practice of assigning private cars to all sorts of officials, and permitting them to be used to give free excursions to people who returned no equivalent for the favors received, became a serious burden to the road. On a railroad whose mileage extends into the thousands, private cars are a necessity for the accommodation of the officers who have to use them as traveling offices, and for sleeping accommodation where hotels are few and far between; but there is always a tendency to increase the number of such cars beyond what is really necessary. It is now a very small railroad that is not taxed for the construction and maintenance of at least one private car, and there are numerous roads struggling along very near the receiver's grasp that spend on private cars money that would help materially to improve the earning capacity of the company. Many of the railroad officers who ride in palatial private cars really neglect the interests of the company they are supposed to serve by so doing; for if they traveled in the cars used by ordinary passengers they would ascertain facts respecting the needs of the business which they ought to know but never learn.

Of late years there has been a rivalry among those entitled to order the construction of a private car to excel each other in the costly form of construction adopted and in the luxurious style of furnishing the same. Certain railroad magnates well able to indulge in that form of luxury have taken pride in providing themselves with peculiarly expensive private cars furnished in the most costly and elaborate style that the car builders' art could devise. Cars of this character ought to be regarded as exceptional specimens of traveling luxury which ordinary railroad men have no right to imitate, yet no sooner does a particularly costly car appear than many railroad officers proceed to have their private cars altered to ape the newest fashion in private car elaboration. There is a road we know of in a Southern State which is so poor that numerous delays have been caused at an important division terminus through an ancient turn-table breaking down under engines intended for passenger trains. To the repeated requests for a new turn-table, the manager answered that the road could not afford it; yet he sanctions the maintenance of two private cars, and recently expended over $2,500 in putting railings on the cars similar to those used in Mr. Austin Corbin's private car. This sort of business is subordinating the interests of the company served to private taste for display. The ostentatious display made by railroad men in gadding over the country in private cars does indirect harm to the companies that is even more injurious than the useless waste of money in keeping the cars running, for those who are working up anti-railroad sentiment find a strong argument in the private car to convince their hearers that railroad companies are drawing too much money from the patrons of railroads.

Because no train charges are entered against the hauling of private cars on the lines where they belong, the officers interested in keeping such cars running delude themselves, and those to whom they are responsible, that the cost is trifling. The only way to demonstate the lightness or heaviness of the cost is to charge to the car regular mileage rates based on actual expense of hauling. Were this done, and all other items of expense incurred for the maintenance of private cars recorded, there would be fewer of these cars overloading passenger train locomotives. It is bad enough for railroad officers to be inspired with a mania for running themselves and friends over their own lines in season and out of season; but it becomes even a greater nuisance when they must needs go junketing to watering places and other places of fashionable resort with their private cars. There is not a railroad running into a fashionable resort that is not burdened during their busy season hauling and storing private cars, for which no charge can be made without seeming discourtesy. On one Sunday in the month of February there were counted no less than twenty-one private cars in the sidings at Jacksonville, Fla., and the man who did the counting said it did not appear to be a crowded day either. It is high time that the practice of dead-heading private cars all over the country was checked.

RAILROAD PRESIDENTS' GOSPEL OF CAR HEATING.

There was a very protracted inquiry before the coroner's jury of the causes that led to the New York tunnel disaster which we commented upon last month, and a verdict was returned exonerating from blame the engineer of the train and the man in charge of the signals, and placing the responsibility for the accident upon the officers and directors of the New York, New Haven & Hartford Railroad. The investigations connected with the inquest were evidently conducted more with a view of creating sensations than for the purpose of eliciting facts respecting the cause of the accident. The desire of the coroner appeared to be to put on the witness stand influential railroad men whose knowledge of practical railroad operating was of the most limited character, instead of the men who were daily in the habit of running trains through the tunnel, or men who knew something about the signals used and the method of operating them. The terms of the verdict are rather mixed, but the decision has led to the placing of the principal directors and officers of the railroad under bonds to answer to the charge of homicide.

There was some remarkably curious evidence given at the inquest, and we do not believe that ever a railroad officer before opened his mouth and so completely got his foot in it as did President Clark, of the New York, New Haven & Hartford, and President Depew, of the New York Central, when they expressed themselves on the subject of steam heating. Mr. Depew said that the safety of heating cars by steam has not been demonstrated. He intimated that his company adopted steam heating because a law was passed making the use of stoves illegal, but he had no faith in the system. He said that a heater pipe burst in his private car and filled his bedroom with steam which would have smothered him had he been inside. In an interview with a newspaper reporter concerning steam heating Mr. Depew said: "If the valve (reducing) should break and the whole force of the steam in the boiler go through the train, in 30 seconds there would not be a person alive in any of the cars." He added some further opinions about the dangers of steam heating that were couched in a similar strain.

In his evidence on the witness stand Mr. Clark said: "Never with my consent will the New Haven Railroad Company adopt a system of steam heating which necessitates a direct connection between the inside of a boiler with 150 pounds steam pressure and a passenger coach in which 50 or 60 people are riding, with nothing to prevent that great pressure of steam from pouring into the car except a spring valve." Should such a pressure enter a car every passenger in the car would undoubtedly be killed within 30 seconds. His road had come to the decision that the Baker heater system, which had been used for 20 years without accident, was the safest.

There is a strong inclination to hold Mr. Clark personally responsible for the death of the persons killed in the accident because his company defied the law that required his cars to be heated by steam, and it is natural that he should try to make the best defense in his power. Accuracy or consistency need not be looked for in evidence that is drawn out under these circumstances, but we cannot account on these grounds for the wild absurdities uttered by Mr. Depew about car heating. The bursting of the pipe which Mr. Depew expressed so much terror about was not a connection of direct steam heat, and the serious nature of the accident was greatly magnified by a nervous temperament.

It may be that these two railroad presidents are sufficiently ignorant of the action of steam to believe that they testified regarding it; but it is a most surprising thing that they did not try to find out something about the effect of escaping steam before they set themselves up as public authority respecting the phenomenon. If either of them had ever been in a Russian bath he ought to have received an object lesson to the effect that a large volume of steam will condense in a small room fast enough to prevent a scalding temperature. The experiments made by the Railroad Commissioners of Massachusetts are conclusive enough for ordinary men as to the harmless nature of a bursted steam pipe in a passenger car, and in addition to that every railroad man connected with the operating of locomotives could supply examples from his own experience, which these presidents could have learned if they had manifested a desire for information. Every man who has adjusted a safety valve knows that the great rush of steam from a pop valve will not burn the hand three feet above the opening. There are few railroad men who have not been in the small one-stall engine-houses, that have little more cubic contents inside than an ordinary passenger car, and have een the doors closed while the engine inside kept blowing off repeatedly all the volume of steam that would pass through the large valve opening; yet there was little rise in the temperature of the house, and no indications of scalding or suffocation.

The position taken by Mr. Depew was singularly unfortunate because his statements were incorrect. It is a well-known fact that the New York Central Railroad had many cars equipped with a steam-heating system years before the law was thought of making steam heating compulsory, and we are much mistaken if Mr. Depew did not claim credit for the enterprise of his company in finding out for themselves the safest method of car heating. The great mistake made in this case is representative of many others It is impractical for the chief executive officer of a great railroad to understand the details of operating and of the machinery connected therewith. The best he can do is to employ efficient heads of departments and hold them responsible for details. If Mr. Depew had testified that his company employed competent men whose duty it was to inform themselves on the best system of heating cars and on the safest method of protecting trains in the tunnel, and that the appliances used were what these men recommended, he would have left the witness stand with dignity. When he posed as a transportation Admirable Crichton, an epitome of all railroad information, at home alike in advising about the form of a reducing valve, the style of a block signal, and the financial policy of a great railroad company, he simply made himself ridiculous.

METHOD OF HANGING BRAKES.

At nearly all meetings where the officers in charge of cars get talking about brake gear there is generally something approaching a unanimous expression of opinion that freight-car brakes ought to be hung to the truck between the wheels, yet the majority of brakes are hung to the car bodies outside of the wheels, and the brakes of the greater part of new cars continue to be hung in this manner. Why do precept and practice differ so diametrically in this matter? At the Chattanooga meeting of the Southwestern Railway Club the subject was again discussed, with the usual result that numerous arguments were adduced for hanging the brakes between the wheels, but none in favor of the most common practice. Perhaps the several speakers may go home and continue the practice of hanging their brakes to the car bodies, but we would like to offer a plea for consistency on this important question. Although they are not usually forthcoming at the meetings where this subject is discussed, there are some arguments in favor of hanging the brakes to the car body. When this is done it is much more convenient to reach the brake gear than where it is crowded between the wheels. This is important when work has to be done or the parts have to be removed in a hurry. Brake gear hung from the car body has springs between it and the rattle of the wheel on the rail; consequently the wear of the hangers and other connections subject to vibration is not so rapid as when they are hung on the part of the truck not resting on the springs. This wear has induced some master car-builders to abandon the practice of hanging the brakes to the trucks. If the brakes are hung to the body bolster or to the truck bolster the destructive vibration is eliminated, but the brakeshoes rise or fall on the wheels according to the weight resting on the car and adjustment of the brake is rendered difficult.

The rapid wear of the parts of a brake hung to the rigid members of a truck and the inconvenience of reaching the mechanism of brakes placed between the wheels, are the drawbacks that seem to be greatly overbalanced by the disadvantages resulting from the practice of hanging brakes to the car body and outside the wheels. In the first place, brakes hung in this manner are dangerous on a rough track, for the shoes bind the wheels in a way that is liable to lift one or more of the wheels off the rail. Those who have watched closely the action of a brake strongly and suddenly applied could not fail to note the terrific pull given to the body sills by the brake hangers. This must in many cases be the straw that breaks the camel's back, and it is a straw that can only be resisted by great vertebral stiffness. Incidental to the jerks and strains that result from the brakes being hung from the car body is the breakage of springs and all other parts of the running gear that happen to be too weak to bear up under hammer blows where the car weight becomes the hammer. When the brake is hung to the body of the car which rises and falls according to the load carried, it is impossible to separate the adjustment of slack which makes this plan peculiarly ill-adapted to cars having the air brake. The beams and gear of outside-hung brakes are much more likely to be damaged by the pilots of locomotives and by buffing posts than those hung inside, which adds considerably to the cost of maintenance. When all the disadvantages attending the hanging of brakes outside the wheels are considered the marvel grows upon us why the practice is so persistently followed.

TO FIND THE RELATIVE VALUE OF HARD AND SOFT TIRES.

The Pennsylvania Railroad Company are making an experiment with tires that ought to be of great interest to railroad men. It is well known that Dr. Dudley, the metallurgical chemist in charge of the laboratory at Altoona, has always been an advocate of soft rails and soft tires. He insists that a moderately soft rail or tire will endure a greater mileage than one made of harder material, and he gives highly plausible reasons to support the soundness of his theories. Presumably acting under Dr. Dudley's advice, Mr. Theo. N. Ely, general superintendent of motive power, ordered from the Latrobe Steel Works tires for eight consolidation locomotives, one-half of the tires to be decidedly hard and the other half of the number to be soft. The chemical analyses of the hard tires showed about 7 per cent. of carbon, while the soft tires contained about 3 per cent. of the hardening element. This makes the difference in hardness so pronounced that there is likely to be a decided difference in the wear of the tires. Before being put upon the wheels of the locomotives the tires were marked and carefully measured. A hard tire and a soft tire were put on each axle. On half of the engines the hard tire began on the right front, and on the other half it began on the left front. This makes a perfectly even distribution of hard and soft tires. The engines have been in service for several months, and a very careful record is being made of the wear of the tires. This will be kept up during the whole life of the tires, and it is expected that by the time they are worn out sufficient information will be obtained to prove exactly the relative value of hard and soft tires.

It may be that the soft tire will prove more economical than hard ones, but we think that a tire of medium hardness will be most satisfactory, for it combines the toughness of the soft metal with part of the power to resist abrasion possessed by every hard surface. Although there was for years great difference of opinion respecting the relative durability of hard and soft rails, there are now few engineers who advocate soft steel for rail heads. Experience has demonstrated beyond question that soft rails wear much more rapidly than hard ones, but that the latter were most liable to break. Rails of medium hardness are now most generally favored. When nearly all locomotives were over-cylindered the soft tire gave the best result in service, because it did not slip so readily as the hard tire. With the improved proportions that are becoming general in locomotive designing, we think that the tire of medium hardness will gain the ascendency just as the rail of the same characteristics has endured through the process that leads to the survival of the fittest.

FRAUDS IN DEFECT CARDS.

The members of the Southwestern Railroad, at a late meeting, felt called upon to discuss the best means that could be employed to prevent the forging of defect cards. We are exceedingly sorry that it was considered necessary to bring such a subject into public notice. The practices that called for a remedy are of such a character that very few men would indulge in for themselves, but they appear to think it is no disgrace to be dishonest in the interest of the companies they serve. According to the speakers at the club meeting, some parties are in the habit of taking off cards that are given for trifling defects, such as mixed drawbars, changing the number of the car, and adding to the card defects that are sometimes of a serious and expensive nature. The road giving the card are thus, by a dishonest trick, charged for expensive repairs that they are not entitled to pay. Men who do things of this kind are thieves, and they deserve to be sent to jail. In last month's NATIONAL CAR AND LOCOMOTIVE BUILDER we published the form of a card used by the Chesapeake & Ohio which has a stub attached, which is used to keep a record of the repairs called for in the original card. Mr. Garstang mentioned in sending us the form of card that it was useful for showing what car inspectors were doing, and that it was a check to prevent other roads from changing the cards. We had no idea till lately that the necessity for this check was so great as it appears to be. Of all the plans we have seen recommended for preventing the fraud of adding to or forging cards we have nothing that seems to be at once so simple and so efficient as the stub card recommended by Mr. Garstang.

DISLOYAL RAILROAD OFFICERS.

When railroad companies find it necessary to incr the size of their engines so that a pair or two of driving wheels is added, there is nearly always contumacy displayed by the trainmen respecting the change, the enginemen as a rule taking the lead in semi-passive resistance to the heavy machines. If the engines prove good steamers and convenient to handle the enginemen are always the first to do them justice, and it generally takes but a short time before the new engines are as popular as the smaller ones were. We have discovered a singular exception to this rule on one of the great railroads running into New York. Small eight-wheel locomotives had been used for all kinds of train service for such a length of time on this road that many of the employés came to consider that no other kind of engine could run on the line. But the continual increase in car loads led to the inevitable change, which must sooner or later come to every railroad that has to compete with other lines in hauling freight, and mogul engines were introduced for freight service. The heavy locomotives were able to pull about 40 per cent. more cars with very small increase of cost; they were convenient engines to handle, and they steamed fairly well, yet they did not increase in popularity. After the engines had been in use two years reports were constantly in circulation that they were a failure and that the company was about to return to the use of the old-time eight-wheeler. The case was so unusual and so curious that we have been quietly investigating it for some time and have discovered a strange condition of affairs. The change in the kind of engines was decided upon by the superintendent of motive power in consultation with the general manager. These officials did ask the division officers about the propriety of making the change, and when the engines were put into service their use was strongly opposed by division superintendents and others who drew inspiration from that fountain of authority. The greater size of train was awkward to handle and frequently caused delays by breakage in two and through want of sufficient siding accommodation; but instead of setting to work and vigorously trying to put the new conditions of train operating into good working order, the division officers and their satellites, including in some instances officers of the mechanical department, abused the moguls and predicted that they would soon be taken off.

Those who understand human nature an the successful operating of locomotives will readily comprehend what followed. The enginemen considered themselves aggrieved at being required to run the engines, the other trainmen attributed every delay, accident and source of annoyance on the road to the big engines, and they came to have few friends except among those directly interested in moving freight at the least possible cost. And this is practically the state of the case to-day. When the superintendents and yard masters, and other men in authority on this road, tell those under them to go, and they go not, there is a shaking of the official fist, and tongues are moved in utterance of threats of punishment to the delinquent. But it does not appear to strike these officers that they are themselves standing examples of insubordination, being constantly in a state of contumacy to their own officers, and that their insubordinate spirit is far less excusable than the disobedience of men lower in the social scale. The discharging of a few superintendents would exert a wholesome influence on those they have led into a condition of disloyalty to the company they serve.

FOURTH ANNUAL REPORT OF THE INTERSTATE COMMERCE COMMISSION.

We have received through the courtesy of Mr. Edward A. Moseley, secretary, the Fourth Annual Report of the Interstate Commerce Commission. It is a book of 443 pages and is filled with information about railroad property. It deserves to be widely circulated. In the ordinary press and platform discussions about the rights, privileges and duties of railroads there is a disposition to extremes by interested parties. One side is interested in magnifying the rights and exaggerating the wrongs suffered by railroad companies, while the other side labors to paint railroad companies as insatiable monsters that are eating out the vitals of the country's substance. The Interstate Commerce Commission is a judicial board with exceptionally good facilities for arriving at the truth about the operating of railroads, and the true interests of the board is to exert their influence in such a way that justice will be done all round.

When this commission was first appointed much apprehension was manifested among railroad managers that the

board would exert a prejudicial influence upon railroad interests, and efforts were made to curtail as much as possible the power of the Commission. To railroad managers trying to do business in a fair and legitimate manner the Interstate Commerce Commissioners have been a help instead of a hindrance, and an unprejudiced person cannot read the report of the fourth year's work without feeling convinced that there is urgent need for the power of the commissioners being materially increased. The class of railway managers which constantly demoralizes rates, and tends to make railroad management ridiculous and a stench in the nostrils of sensible business men, is always ready to defy the regulations of the Interstate Commission, and it would greatly accrue to the benefit of railroad property owners if the Commission were given power to promptly and severely punish those who violate the regulations issued.

A very valuable portion of the work done by the Commission has been in acting as arbitrators in disputes between contending railroad companies and between railroad managers and their patrons. This field might be greatly extended with advantage to all concerned, and it would be a very desirable change if disputes between railroad companies and their employés were referred to the Commission for settlement.

Among the subjects that are very impartially discussed in the report are: Practical Working of Regulations; Rate Wars and Rate Cutting; Reasonable Rates; Uniform Classification; Long and Short Hauls; Ticket Brokerage; Accidents, and a variety of other matters. The volume is well worthy of study by those wishing to learn the truth about the questions discussed.

Against Private Stock Cars.

A movement has been made among certain of the trunk lines during the past month indicating a determination to stop the practice of operating private stock cars. It is estimated that the difference in the cost of handling the live-stock business in cars owned by the roads and those owned by private shippers is equal to fully five cents per 100 pounds, and that margin is vitally important when the low tariff on live-stock is considered. Desperate efforts are being made by the private stock companies to perpetuate their privileges, but the leading trunk lines are determined to extirpate the abuse, even if it is necessary to call upon the Interstate Railway Commissioners for the fullest exercise of their powers to prevent discrimination in rates.

We always like to see railroad companies making business-like efforts to obtain the profits of the transportation business which belongs to them, but if they are going, by the aid of the Interstate Commissioners, to stop the use of private stock, why not put an end to the use of all kinds of private cars, particularly the "line" cars that absorb so much of the earnings of railroad companies? This is a case of the other man's steer being gored. There are too many railroad officers who are stockholders in "lines" that run cars of their own.

A correspondent whose letter in another column is signed "Justice," takes us to task for intimating in a previous issue that certain railroad companies or their employés were mean enough to use cast iron for the knuckles of the M. C. B. coupler. We are not prepared to back down any from the position we took in the matter. The case cited at the New England Railroad Club, and which drew out our remarks, occurred no doubt through the ignorance of an inspector who was not aware that he was violating any law or rule in putting in cast iron knuckles. We are ready to admit that the case which started us to denounce the practice was not a deliberate attempt to palm inferior material upon a confiding class of railroad men, but nevertheless our remarks were by no means unseasonable, for we have reason to believe that cast iron knuckles are not altogether unknown in different parts of the country. It is very sweet and confiding on the part of our correspondent to protest against our blaming railroad men for evil practices until they have been found guilty. Our only regret is that so many men connected with the interchange of cars have proved much more against themselves than we have ever dreamed of charging. We would like to believe, and would delight in asserting if we dared, that the officers of the car departments were always honest and straightforward in their dealings with each other. When it has been found necessary to publicly call for help in devising means to prevent the forging of defect cards, we are not far astray in intimating that there are practices followed in the dealings of railroad companies with each other concerning cars that are discreditable in the highest degree, and even that is stating the case mildly.

Different forms of pressed steel are making rapid progress into favor for car work, but there is one article badly wanted which is slow in making its appearance. One of the most expensive parts of a car to maintain is the oil-box. The Master Car Builders' standard box, when made of cast iron, is too weak for the heavy cars and high speed that is now common, and the breakage on some roads is a very serious item of expense. What is wanted is a pressed-steel box. There are pressed-steel oil-boxes now used largely in England, but they are made on a simpler pattern than the M. C. B. box, and are made in sections, which are bolted together. To obtain a ready sale and an extensive market we must have a pressed-steel box that can be used as a substitute for those now in use. If any inventor should succeed in devising a method for squeezing soft steel into the form of a modern oil-box he is certain to find millions in his invention.

New York City is so well supplied with first-class daily newspapers that it seems a bold enterprise to add a new one to the number; yet this has lately been done with pre-eminent success. A bright, newsy, fearless daily called the *New York Recorder* lately appeared, and has made a surprising jump into public favor. The editors of the paper do not strive to regulate the political and religious beliefs of their readers so much as to present plenty of fresh news properly digested into interesting reading form. The call for the Sunday edition of the *Recorder* by newsdealers is said to be already over 200,000, which proves that the paper is got out in the style which is popular with readers.

Personal.

Mr. James E. Cross, Eastern manager of the Adams & Westlake Company, died very suddenly in Chicago last month.

Mr. Marvin Hughitt, president of the Chicago & Northwestern, has been confined to his bed with the grip for three weeks.

Mr. Robert J. Fisher has been elected general counsel of the Eastern Railway Association, to succeed Mr. Andrew Callum, deceased.

Mr. Geo. N. Riley has been appointed master mechanic of the McKeesport Connecting Railroad, with headquarters at McKeesport, Pa.

Mr. Depew is said to have been offered $100,000 a year to edit a newspaper, but he is so busy editing a railroad that he can't accept.

Mr. B. K. Verbryck, general master car-builder of the Chicago, Rock Island & Pacific system, has been very sick, but he is getting better slowly.

Mr. Samuel Pullman, for many years master car-builder of the Chicago, Rock Island & Pacific shops at Chicago, has resigned on account of failing health.

John Stephenson, the man who built the first street car, is a very hale old gentleman at the age of 80. He is frequently seen walking on Broadway in preference to taking a car.

Mr. W. J. Murphy, for some time general superintendent of the Erie Railroad, has been appointed superindent of the Brunswick division of the East Tennessee, Virginia & Georgia.

The destinies of the Jacksonville, St. Augustine & Halifax River are carefully guarded by Mr. Crawford, of operating, and Mr. Silvius, of mechanical departments, both most efficient men. It still maintains its right to the cognomen, "Florida's Pride."

Mr. C. W. Rickard, who has been for several years master mechanic of the Nitrate Railways of Chili at Iquique has resigned and is on his way home. Mr. Rickard is an Iowa man and began his railroad career on the Burlington, Cedar Rapids & Northern Railway.

Mr. Rogers, S. M. P. of F. C. & P., recently from the A., T. & S. F., goes in his new field well equipped for the duties. His ability as a mechanic is of the growing kind. Evidently he aims (as all should) to maintain a receptive frame of mind; this must inevitably bring progress.

Mr. Robert Quayle, who has been for the last four or five years master mechanic of the Chicago & Northwestern at Clinton, Ia., has been appointed master mechanic of the Milwaukee, Lake Shore & Western. Mr. Quayle was brought up in the C. & N. W. shops at Chicago under Mr. Tilton.

Mr. W. M. Mitchell, a conductor in the employ of the Atchison, Topeka & Santa Fe, has been elected Railroad Commissioner of Kansas by the Executive Council to succeed Judge James Humphrey. He has been working on railroads for 20 years as brakeman, fireman, station agent and conductor.

Mr. C R. Peddle, purchasing agent of the Vandalia line is Secretary of the Rose Polytechnic Institute, Terre Haute Ind. Mr. Peddle informs us that there is an excellent engineering school connected with the institute, and he thinks it would be a good establishment for the Master Mechanics' Association to have scholarships.

Mr. J. M. Whitman, general manager of the Chicago & Northwestern Railway, has gone to Florida, with a view of recruiting his health. He was confined to bed for two weeks before leaving Chicago, but is now sufficiently recovered to be enabled to undertake the journey to the South, where he will remain until his health is improved.

Mr. William Argue, who was appointed master mechanic of the Savannah, Americus & Montgomery Railway last year, is making an excellent record in that position. He is an old pupil of Mr. Charles Graham, and speaks very warmly of the aid he received from Mr. Graham when his mechanical ideas were in the shooting stage of development.

A friend who visited Mr. Charles Graham lately informs us that he is slowly recovering his strength and that there is a very encouraging prospect that he will be able to be round again soon. When Mr. Graham gets well enough to attend to business he will resume his duties as active general master mechanic of the Delaware, Lackawanna & Western.

Mr. T. M. Ramsdell has been appointed general foreman of the Wisconsin Central Car Shops at Stevens Point, Wis. Mr. Ramsdell has been with the company for about four years, having been pattern maker and then a draughtsman for Mr. Player at Waukesha, Wis. His father is one of the most skillful pattern makers in the West and has been for years with the Central Iowa at Marshalltown.

Mr. R. A. Parke, general Eastern agent of the Westinghouse Air Brake Company, has been making a Southern tour, attending to brake interests. While in New Orleans Mr. Parke was one afternoon strolling round the streets when he suddenly found himself in the midst of an excited crowd which carried him towards the jail. He thus became an unwilling witness of the lynching of the Italians.

Mr. Louis C. Todd has been appointed master mechanic of the Boston & Maine, with charge of the Passumpsic division. Mr. Todd learned the machinist trade in the Mason Locomotive Works, and for the last eight or ten years has been with the Boston & Maine as machinist and foreman. Mr. William Smith says he is one of the ablest mechanics in railroad work and a very successful manager of men.

Mr. C. M. Leonard has been appointed master car-builder of the Chicago, Rock Island & Pacific with charge of the Chicago shops. Mr Leonard was transferred from Davenport, Ia., where he has had charge of the car department for several years. He has been brought up on the Rock Island road, having begun work in the Chicago shops in 1868. Mr. Leonard is an excellent mechanic, a pushing clear headed shop manager and a highly popular man.

Mr. John Hickey has left the Milwaukee, Lake Shore & Western to take the position of superintendent of motive power of the Northern Pacific. The good fortune of Mr. Hickey in obtaining this high appointment is due to his merit as a mechanical officer. His connection with the Railway Master Mechanic's Association, of which he is vice-president, has brought him prominently before railroad managers, but what recommended him for a higher position was the excellent management of his department.

At the annual meeting of the New England Railroad Club the following officers were elected: President, F. M. Twombly; Vice-President, John T. Chamberlain; Secretary and Treasurer, F. M. Curtis; Executive Committee, F. M. Twombly, F. D. Adams, J. N. Lauder, J. M. Marden, L. M. Butler, John Coughlan, George Richards, John T. Chamberlain and E. E. Davis; Finance Committee, John Kent, A. J. Barber, Daniel S. Page, George B. Sweet, Henry L. Leach, Joel H. Hills, Osgood Bradley and George H. Wightman.

Recently Mr. F. D. Childs, formerly manager of the Hinkley Locomotive Works, has made a thorough inspection of the locomotives and equipment of the New England road, and has certified that the engines are in good order and condition and capable of performing the service required of them. He also states that in his judgment the motive power is in better order than it was on the first day of January, 1890, and fully up to the proper standard. He also confirms the same statements as regards the general equipment of the company.

William G. Douglass, one of the oldest civil engineers in the country, and for many years prominently connected with the Baltimore & Ohio Railroad, died at his home in Wilson county, Va., last month. He was 72 years old. His first service was on the preliminary line for the Alexandria & Orange Railroad, now belonging to the Danville system in Virginia He made the first survey for the Manassas Gap Railroad, from Manassas to Strasburg, Va., and the preliminary survey for the Rockfish Gap Tunnel through the Blue Ridge for the Chesapeake & Ohio Railroad. He was civil engineer on the Baltimore & Ohio road, doing work under Chief Engineer Latrobe on the Hancock division. In 1851 he was division engineer on the Central Ohio Railroad from Wheeling to Columbus. He then formed a copartnership under the firm name of Douglass, Smith & Co., and contracted for building all the cars and bridges of the Central Ohio and other roads. The panic of 1857 broke up his business. In 1872 he was division engineer on the Atlantic & Lake Erie Railroad in Ohio.

Communications.

Wrong or Mixed Drawbars.

Editor National Car and Locomotive Builder:

This is one of the most difficult questions that inspectors are called upon to decide, at the present time, when the view of doing just what is right for both delivering and receiving companies is strictly adhered to. In the first place, let us consider why such a large proportion of cars are fitted with what may be considered wrong or mixed drawbars. For instance, if a company having a number of cars built some time ago, and fitted with common wrought drawbars, changed to the Potter or three-link, and from the Potter to malleable or cast, without changing the dimensions in the least, simply changing the material for more efficient service, by this time the drawbars are pretty well mixed, and largely by the owners. Should these drawbars be considered wrong or require a card in the interchange, especially between foreign companies?

Or again, taking a company that has bought or controls a number of smaller roads, the latter having different drawbars from the former. They do not wish to change the drawbars; at the same time the initials are changed to that of the owners' line, which accounts for the variety of drawbars in cars bearing the same initials. Then again there are a number of companies that make no pretension, nor do they wish to exact from their connections a facsimile of the drawbars with which cars were originally equipped.

They are perfectly satisfied to accept drawbars fitted in their cars, providing their standard size and length is adhered to. Now it can be easily seen, under the above circumstances, that there is a large number of cars running with what might be termed wrong or mixed drawbars. The question now arises. Who is responsible? A car probably one thousand miles from home is to be delivered to a receiving company which says, "There are two kinds of draw heads on this car; you will have to card for mixed drawbars before we receive the car," when, at the same time, in all probability, they were applied by owners; and, even if they were not, the owners would accept the car without a murmur, and not think of asking for a card. But, should they see a defect card nailed on the tie timber calling for both drawbars applied by a company a thousand miles away, like Queen Mab, might they not say, "Probably we had better change those drawbars to save further trouble, and the card may even up a similar change against us"?

Now, my idea is simply this; that any company adopting a drawbar should issue a circular to that effect and rigidly maintain it themselves; then it would be only fair that each and every company fitting one in place that materially differs from the original should apply a defect card covering same. But, just so soon as owners do not think enough of this class of drawbar to maintain it, either due to its not coming up to their expectations, or the adoption of another more favorable to their ideas, they should cancel the circular and accept from connections any of the types used by themselves suitable for that build of car, without adhering strictly to the pattern or material.

J. C.

Cast-Iron Coupler Knuckles.

Editor National Car and Locomotive Builder:

It appears to me that your article in last month's NATIONAL CAR AND LOCOMOTIVE BUILDER upon cast-iron knuckles was one of the alarmist order of railroad literature. There is a great deal of talk going on about cast-iron knuckles, and I believe it is more due to your article than to the presence of cast-iron knuckles on cars. I have a very good opportunity for seeing these things, and I have not yet seen any cast iron knuckles, although I have seen plenty of poor steel ones, and some made of malleable iron that appear to be little better than honest cast iron. If there was better material put in the vertical plane couplers, and especially in the knuckles, there would be less complaint from breakage. From all corners of the land comes the shout "The vertical plane couplers are breaking!" but those who shout loudest do the least to effect a remedy. I say, without fear of successful contradiction, that hook couplers would stand as well as link and pin couplers, if they were made of the proper material. The hook is a naturally weak form and it needs proper material to overcome its natural weakness.

But that is not what I started out to write about. I want to protest against the wholesale charge that railroad companies are using cast iron for knuckles. When the matter was brought up before the New England Railroad Club, Mr. Chamberlain said that the cast-iron knuckles were made by a car inspector who thought that all knuckles were made of cast iron. The thing was done through a misunderstanding and nothing more. I do not believe that there is a single master car-builder in the United States to-day who would be guilty of the meanness and dishonesty of deliberately applying cast-iron knuckles. People who talk lightly about such things do not realize the enormity of the practice. It is playing with men's lives. Our master car-builders are not the kind of men who permit themselves to engage in such infamous practices. This is a self-evident fact, which you will find it hard to dispute. I would then like to make the point that you have no right to say or imply that the practice of applying cast-iron knuckles is engaged in by any railroad company. When there is good reason for believing that the lawless practice exists, it will be time enough to begin making pains and penalties for it, and to introduce rules requiring knuckles to be stamped, as an evidence of good faith. JUSTICE.

Down-Draft Furnaces.

Editor National Car and Locomotive Builder:

In your March number I see an account of the trial of a down-draft locomotive on the Maine Central, which, according to your correspondent, proved to be a failure. In closing up he remarks: "A curiosity about inventions of this kind is, how they delude practical men, who might be expected to see their shortcomings at once!" In saying this I believe your correspondent to be a little too hasty, as the down-draft furnace on locomotive engines is no longer an experiment, but an assured success. The only reason for the failure of this device on the Maine Central is, in my estimation, faulty design.

Enclosed I send you a blue print of a down-draft furnace as tried in a Hinkley four-wheel coupled engine, 15 × 22-inch cylinders and 63-inch drivers; grate area, 30 × 31 inches. This engine hauled three coaches and one baggage car a distance of 115 miles on a little over one ton of coal, and made schedule time all the way. Grades on this division vary from 50 to 100 feet per mile.

This device was put into an old worn out fire-box for trial and made plenty of steam with an ordinary quality of coal; with good coal the engineer had trouble to keep her from popping continually.

This device is also in use in about 15 stationary boilers in St. Louis; is a great economizer on fuel and a free steamer. It consumes all smoke, not partially, but all of it, by reason of a perfect combustion.

Your writer further says that in attempting to force a down-draft fire-box the intense heat would be liable to cause the water tubes to explode and injure the men on the foot-board. To my knowledge these water tubes last as long as the flues do, that is, in a device properly designed.

DRAFTSMAN.

Relation of Stack to Draft.

Editor National Car and Locomotive Builder:

Having read with great interest your synopsis of Mr. A. E. Mitchell's paper before the New York Railroad Club, and also your remarks upon the same, I would like to add mine as not agreeing entirely with either, and hoping that by an expression of opinion others may be prevailed upon to give their views.

One will hardly deny that the cast-iron stack as used on the Erie is practically an ejector; but I fail to see that there is any definite mathematical relation between the grate area and diameter of stack, or that the size of flue openings should be considered.

This of course brings us to the question, What is the real factor in determining the size of stack? My opinion is that it is the distance from top of exhaust nozzle to base of stack or, more properly, the stack waist. To quote from the paper: "The exhaust steam together with the smoke and gases of combustion, passing into the neck of stack nearly fill it, and then, expanding rapidly and filling it, causes the partial vacuum to be maintained"; but if this is not almost entirely filled we have practically a loose plunger, and as the force of exhaust dies away our vacuum ceases sooner than it should, and we have less results.

Steam escaping from the nozzle expands in the form of a very sharp cone, and one that increases rapidly as its distance from point of exit increases; so we can fill the stack by either decreasing the size (of stack) or lowering exhaust nozzles; and having once obtained by experiment the proper diameter for distance from exhaust tip to stack waist, it should always be the same.

This cone of steam varies but little in size with changes of pressure (within working limits), so that our stack should be the same size for different conditions of work, an increased or decreased vacuum being obtained by velocity of escaping steam; in other words, the size of nozzle regulating pressure of exhaust steam makes the difference of vacuum more than a variation in the size of cone.

To get the best results, or rather have the lowest back pressure for vacuum obtained, the exhaust pipe should be made as short as possible to give sufficient area of netting not to impede the flow of gases. Another practice, and one not generally followed, is: where double nozzles are used, to incline them towards each other, so that they are lined for center of stack at its top, and in this way come nearer filling it. Generally the nozzles are parallel and vertical, and the exhaust strikes hard on one side of the stack and not on the other.

Considered as an ejector, the size of the stack and corresponding height above exhaust nozzle, is a fixed instrument so proportioned as to give the *greatest vacuum* with a given pressure of steam. The pressure (or size of exhaust nozzle) should be regulated by steaming of engine, increased if the grate area is small or area through flues contracted, and decreased with opposite conditions, but always so as to produce the best vacuum with lowest back pressure.

The facts from which the above conclusions were drawn were obtained in a shop where the change was being made from the ordinary straight stack of 16½ inches diameter at waist and the diamond stack of 18 inches or 19 inches, to the cast iron stack of 15½ inches, and had good opportunities for observing how the same diameter of stack worked on all engines, from one with a smokebox 66 inches diameter to one of only 51 inches.

This latter size of smokebox, with a 15½-inch stack, was on an 18 × 22-inch engine (burning hard coal), and although the grate surface was 27 square feet, the nozzles were 2⅞ and 2⅞ inches diameter, and it was very hard to get steam on through runs; in fact, they very often lost time, the heating surface being about 1,100 square feet. In two cases, where time was very often lost, the stack was reduced from 15½ inches to 13½ inches, the nozzles enlarged from 2⅞ inches to 2⅞ inches, and during about two months only once did either engine not make time from lack of steam. On a 20 × 24-inch consolidation engine, with smokebox 54 inches diameter, where 3½-inch nozzles were used with the diamond stack, they being about 12 inches from bottom of smokebox, a change to straight stack necessitated using 3-inch nozzles. On a test of such engine, with stack bushed from 15½ inches to 14 inches, an increase in the smokebox vacuum was obtained from 4½ inches to 5½ inches of water.

From observation on a 56-inch boiler, the smokebox being 60 inches diameter, reducing the diameter of stack from 16½ inches to 15½ inches made the engine steam more freely, but not enough to enlarge the nozzles. The dimensions of this engine were: Cylinders, 19 × 24 inches; driving wheels, 68 inches; nozzles, 3½ inches; grate surface, 40 square feet; heating surface, 1,700 square feet; fuel, anthracite coal. Of the application of this stack to engines with 66-inch smokebox I have had no means of making a test, but think the stack too small, from the fact that a 3⅛-inch or 3¼-inch nozzle has to be used, the engine having cylinders 20 × 24 inches, grate surface, 42 square feet, and 2,000 square feet of heating surface.

I can heartily agree with you that nearly all the railroads using the open stack use it too large; as can be seen by observing the drawings that from time to time appear in your paper, and comparing them with the stacks used so successfully on the Erie, Richmond & Danville and Wisconsin Central. This latter road is using a 13½-inch stack for all engines (21 having 56-inch boilers) and reports them as doing very well.

A fact that should be mentioned in connection with the improved performance of the Erie engines, after the change to smaller stacks, is that at the same time a grate bar was adopted as standard, which I believe contributed as much or more to this improvement. The openings in this grate are, as you know, smaller, but there are more of them. There is much less coal wasted by dropping into the ash pan, and they are more easily kept clean from clinkers, a fact tending to good combustion.

While I am not prepared to make rules for locomotive design, it seems as if the first rule given by Mr. Mitchell for boiler design is not properly expressed. He says: "Use cylinders one inch smaller in diameter than you design your boiler for." If we are to use a smaller cylinder than our boiler is designed for, and it will then be of the proper size, manifestly we have not made our design correct in the first instance, and our rules or proportions of parts are all wrong.

It is a fact that for a free-steaming engine it is necessary to have sufficient heating and grate surface to provide more steam than will be used by the cylinders under the heaviest work. For this reason I would, after having decided on the size of cylinder, diameter of driving wheel and weight of engine for the work it is expected to perform, make the boiler as large as possible within such limitations.

That there can be no extreme point beyond which it is possible to go in the matter of grate surface may be seen in the economy of the Wootten firebox, and regarding heating surface, the general tendency of the country to higher pressure demands a heating surface larger than it is often possible to give.

W. H. ELLIOTT.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY,
Mechanical Engineer's Office,
MILWAUKEE, March 20, 1891.

Imperceptible Slip of Locomotives.

Editor National Car and Locomotive Builder:

Several years ago a French engineer announced that it was not a safe rule to multiply the circumference of the driving wheels of a locomotive by the number of revolutions per minute in order to obtain the distance passed over when running at high speeds; and that there was an insensible slip at a certain period of each revolution of the wheels which caused the error between the calculated and actual distance. In a communication to the *Railroad Gazette* about that time I ventured to suggest that this slip was caused by the action of the counterweights put into the driving wheels to balance the reciprocating parts of the mechanism. These counterweights balance the momentum of the reciprocating parts fore and aft, but vertically they act as disturbing forces, increasing the weight on the drivers in their descending path, and decreasing that weight on their ascending path by the amount required to arrest the momentum due to the centrifugal force of the weights; that if an engine is so proportioned that the adhesion of

the wheels is but slightly in excess of the force applied to the crank pins by the steam, then in all probability this momentary reduction of the weight on the drivers will cause an imperceptible slip.

The editor kindly published the communication, but added a note in which he said that it had been shown that no such slip occurred, which silenced if it did not convince me. And now comes Mr. Barr with indisputable figures. and shows that the mysterious and irregular wear of tires is due to this same slip caused by the action of the counter-weights.

Terre Haute, Feb. 7, 1891. C. R. P.

The Squeeze and the Pull Brake.

Editor National Car and Locomotive Builder:

There has been a controversy, extending over a period of several years, between the advocates of the "squeeze" and the "pull," or "crowd," principles of applying brakes to the drivers of a locomotive, regarding the merits of their respective systems. As I understand the matter, the advocates of the "squeeze" brake, by which is meant the application of a shoe on each side of the wheel, claim that they can use a higher percentage of the engine weight in brake pressures than their rivals; while the "crowd," or "pull," brakemen, who use only one shoe per wheel, claim that they reach the same point of resistance, namely, that of causing the wheels to be just upon the point of skidding, and that therefore the absorption of momentum or the resistance to the motion of the engine is the same as with any other style of brake that brings about the same results —namely, the bare escape from the skidding of the wheels.

In all the talk and literature on the subject, however, I have failed to find a single case where the reasons were reduced to the why and the wherefore, but each speaker or writer has contented himself and apparently his audiences and readers by purely theoretical deductions with no attempt at a Q. E. D.

In discussing this question I shall take it for granted that both parties tell the truth. As I understand the matter, the "squeeze" men say that 80 per cent. of the weight on the braked wheels is allowable in brake pressures. The "pull" men make an allowance of 65 per cent. We will ignore all the katydid and katydidn't talk about strains on frames and rods, since we are after stoppage or brake resistances.

For the sake of convenience let us consider that one per cent. of the weight of the engine applied upon the tread of a 63-inch (outside of tire) wheel, with a steel tire and plain cast-iron shoe, is one unit of brake resistance. We will take the coefficient of friction between the shoe and the tire, or between cast iron and steel, as .194. Hence one unit of resistance will be equal to

$$.194 \times .01 = .00194$$

of the weight on the braked wheels.

In the "pull" brake we have two elements to be taken into consideration. First, there is the pressure of the shoe upon the tread; second, the counter-pressure of the box on the axle, for this last resistance must contribute somewhat toward the stopping of the engine.

We have, then, 65 per cent. in brake pressure and 65 per cent. in extra journal pressure, or 130 per cent. of the engine's weight in all.

The brake pressure gives us 65 units of resistance. The coefficient of friction between the axle and the box may be placed at .075.

But .075 is only .387 of .194; hence for the same pressures we would have only .387 as many units of resistance when comparing the journal with the brake-shoe resistance.

Therefore, at the axle we have $65 \times .387 = 25{,}125$ units of resistance.

If we take the diameter from the axle as 7 inches or $\frac{1}{9}$ the wheel diameter, we have $\frac{25{,}155}{9} = 2{,}795$ units of resistance at the tread of the wheel.

Adding 2,795 for journal resistance to 65,000 for shoe resistance, we have 67,795 units of resistance for this brake apparatus.

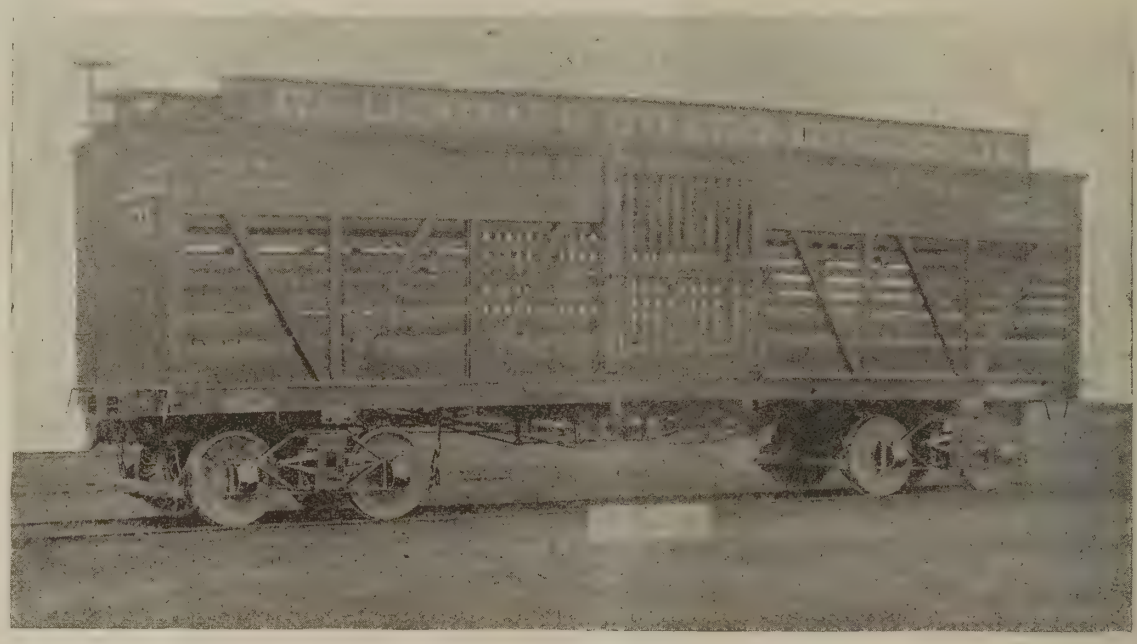
The "squeeze" brake, according to definition, has no extra journal friction and has merely 80 units of resistance, or a trifle over 18 per cent. more than the "pull" brake, which may serve to explain some of the claims of its advocates. The figures will vary, according to the percentages of brake pressures allowed each system and to the variation in the diameters of the wheels and axles; but the principle is readily applied and can be easily worked out for the particular case in hand.

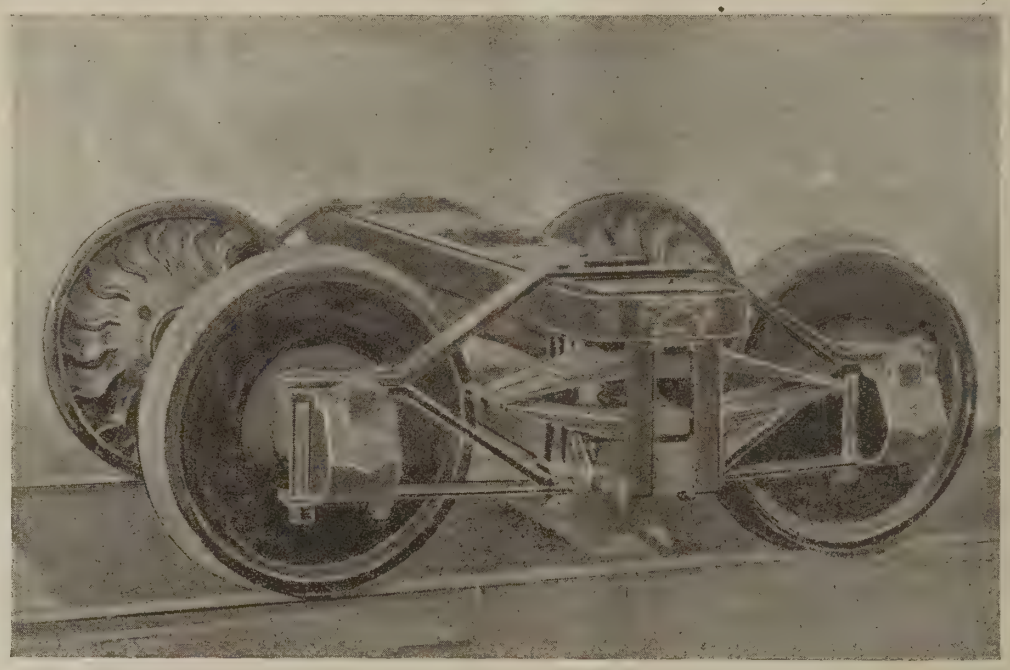
Hence to an outsider and a layman it would appear that, unless the "pull"-brake men raise the figures of brake pressures very considerably they must acknowledge that their braking powers are less than those of the "squeeze"-brake men, and that their near approach to the skidding point is due to the cramping of the rods and brasses, and not to the legitimate frictional resistance of the brake shoes. Geo. L. Fowler.

[It appears to us that our correspondent does some special pleading for the advocates of the squeeze brake. The makers of all kinds of brakes appear to regulate the power applied so that it will nearly reach the sliding point, and that is all which is necessary, no matter in what way the power is transmitted. We believe our correspondent is not correct in saying that the designers of the one-shoe brake limit themselves to 65 per cent. of the wheel weight for braking force.—Editor.]

An Easy Riding Truck.

In the annexed engravings we illustrate the Lackawanna Live Stock Company's car and the truck, the latter being of a peculiar construction, designed with a view of getting in long elliptic springs (36 inches between centers) that make the car one of the easiest riding stock-cars among the many different forms to be found on railroads. Although the truck is of the rigid center kind, it is given a slight lateral movement by means of rollers sufficient to relieve binding. The truck is very substantially built, and besides being easy riding is very strong and durable. Trucks of this kind that we have examined after being in service for two years show no indications of weakness or wear of parts. For the fast train service now becoming common in rushing live-stock to market we know of no truck better suited than this one for combining safety and efficiency.





Master Mechanics' Circulars.

Two committees of the Railway Master Mechanics' Association have issued circulars during the last month asking for information on subjects under investigation. Mr. W. H Thomas, of the East Tennessee, Virginia & Georgia Railroad asks for facts about the examination of engineers and firemen by the following queries:

No. 1. Do you examine engineers employed from other roads on anything except time card rules? If so, what plan do you pursue and of what does the examination consist?

No. 2. Do you examine firemen, candidates for promotion? and if so, what line of examination is followed?

No. 3. In hiring men for firemen, what age do you consider the limit past the age of 21 years?

No. 4. Do you advise the first year in service as fireman be on a switch engine?

No. 5. What do you consider the shortest time a fireman should serve in that branch of service before he is allowed examination for promotion to engineer? If a fireman fails in an examination, how do you deal with him?

This subject is very closely connected with the economical operation of locomotives, and it is highly desirable that the committee should receive sufficient information to advise them of the practice followed on most railroads. Any information on the subject that a member may have, and which is not drawn out by the questions, will be gladly received by the committee.

Mr. W. T. Small, chairman of the Committee on Purification of Feed Water, asks for answers to the following questions:

1st. Have you had any experience with mechanical devices? If so, with what result?

2d. Have you tried chemicals, and with what result?

3d. Have you found practical, and do you recommend for use, any of the mechanical or chemical devices for purifying water? Please tell briefly what your experience has been with any method that you have tried, and also make any suggestions or recommendations that will be of use to the committee.

A Choice of Names.

The *Railway Master Mechanic* has been compiling a list of the names which are in use on different roads for the head of the mechanical department. The list, with the number of roads using each name, is as follows:

Master mechanic, 267.

Superintendent of motive power and machinery, 39.

Superintendent of motive power, 37.

Foreman of locomotive repairs, 10.

Mechanical superintendent, 9.

General master mechanic, 7.

Superintendent of machinery, 7.

Master of machinery and foreman locomotive and car repairs, 4 each.

Superintendent of motive power and rolling stock, general superintendent of motive power, master machinist, superintendent of rolling stock, superintendent of motive power, machinery and rolling stock, general foreman of shops, 2 each.

Superintendent of machinery and rolling stock, master of rolling stock, superintendent of rolling stock and machinery, superintendent of machinery and motive power, superintendent of locomotive repairs, general foreman of locomotives, superintendent of equipment, master of motive power and machinery, general foreman, foreman of shops, 1 each.

Note.—Bearing title of M. C. B., together with some one of foregoing—a few cases only. There are four cases where there is a master car-builder alone, and 71 cases where there is a master car builder with some one of the foregoing officials on the same road. Four roads have a superintendent of car department.

In conclusion our contemporary says: The ideal title should be comprehensive and exact. It should not be cumbersome, and on general principles its euphony should be studied. While not presuming to suggest such a title, we must confess to a sneaking fondness for the Canadian title, that is "mechanical superintendent." This seems to tell the whole story as smoothly and briefly as any of them, and at the same time possesses a dignity as strong or stronger than is found in "master mechanic," the dignity of which latter, though inherent and pronounced, is lessened by frequent application to division officials.

One of the Michigan Central 10-wheel engines lately pulled the North Shore limited passenger train of six heavy vestibule cars from Jackson to Michigan City, a distance of 153 miles, in 160 minutes.

The Chicago & Erie Company will erect at Huntington, Ind., a building 250 feet long by 75 feet wide, in which to do car repairing. This will increase their force of shop hands at that point about 100 men.

A steam phaeton has appeared in Paris resembling an ordinary phaeton. It carries under the body of the carriage a boiler "which cannot explode," with a funnel bent down and discharging smoke under the back seat.

The shops of the Ensign Car Company, at Huntington, W. Va., are at work upon an order for 1,000 cars for the Mexican International Railway, and several other large orders for Western roads. The company will soon commence upon a large addition to the car wheel shops.

The Elevated Railroad Company of New York are trying another locomotive with the Swinerton facets milled upon the wheels. This is the third engine experimented with in this way by the same company. Mr. Rouch, road foreman of engines, is an enthusiastic advocate of the Swinerton patent.

The Wason Car Manufacturing Company, Brightwood, Mass., has orders for 101 passenger cars, to be delivered during the next five months to the following railroads: 22 to the Old Colony, 50 to the Manhattan (elevated), 20 to the New York, New Haven & Hartford, and 9 to the Los Angeles Terminal.

The site for a stone to mark the starting point of the first locomotive ever used in this country, "John Bull, No. 1," was located near the Mile Hollow, near Bordentown, N. J., by the Pennsylvania Railroad, recently. Around the base there will be a railing composed of the rail and spikes of those early days.

The New York, Providence & Boston is having two locomotives built at the Manchester Locomotive Works, in addition to the three six-wheel switching engines which are being built by the Rhode Island Locomotive Works. The engines are of the American type, with 17 × 24 inch cylinders and driving wheels 5 feet 6 inches in diameter.

The Safety Car Heating and Lighting Company, of New York City, has closed contracts with the New York, New Haven & Hartford to equip 50 passenger cars of that company with apparatus for continuous steam heating. By the system adopted the steam pipes will be kept outside of the cars, which will be heated by hot water circulation, the water being heated by steam.

A tire on one of the drivers of Michigan Central engine No. 219 broke last night and the engine is laid up for repairs in consequence. This is the third engine to be similarly disabled within a month, and the circumstance is remarkable. The tires are made of the best steel and usually run for years or until worn out. The Central imports all it uses from the famous Krupp Steel Works in Germany.—*Niles paper.*

Manufacturers in lower South Carolina claim that the railroads have put rates up so high as to virtually force them out of that part of the country, several mill men having pulled up stakes and located elsewhere. How a railroad can expect to thrive by that kind of a policy is a mystery. It may not feel the results of its course at once, but time will show the folly of killing off traffic so large and important as that of the lumber business. There is no sense in making freight rates that will eat up all the profits of manufacture.

The car oil lamp is taking prominence as a fire starting successor of the car stove. The two coaches were burned in the Cincinnati, Wabash & Michigan yards in Anderson, Ind., last month. The train had been made up to go north, but just before time to pull out of the yards a lamp in one of the coaches exploded, and two coaches were burned as stated. The cause of the explosion is not yet ascertained, but it is under investigation. This is an accident of special importance as bearing on the safety of lighting with mineral oil, and the results of the investigation will be looked for with unusual interest.

The Pullman Car Company is now working on a large order for palace sleeping cars for the British Colonial Railway in Australia. As a result of correspondence an order for a large number of cars was placed with the company, and the work is now well along towards completion. All the cars are built in sections and are to be put up, painted, and upholstered by the company's workmen in Melbourne A temporary plant will be erected there and a force of expert carpenters, painters and upholsterers will be sent from here to do the finishing work. The cars are to be the equal of the latest cars turned out by the Pullman company and are to be sold outright to the railroad company.

The Rhode Island Locomotive Works have lately delivered to the New York, New Haven & Hartford five American type engines with 18½ × 24 inch cylinders and 68½ inch wheels. Two mogul locomotives with 19 × 24 inch cylinders have been shipped to the Fort Worth & Rio Grande. The works now have orders for about 21 locomotives. These include four 19 × 26 moguls for the Maine Central, three 18 × 24 six-wheel switching engines for the Old Colony, two 18 × 24 mogul and three 17 × 24 for the Milwaukee, Lake Shore & Western, six 17 × 24 for the Wabash, and three 19 × 24 for the Mexican Central. All these locomotives except the moguls are six-wheel switching engines.

Speaking on the question of slack adjustment and its relation to the manner in which the brakes should be hung, Mr. N. W. Gibbs said: Our experience with driver brakes may prove somewhat instructive in this case. When we first used the Westinghouse driver brake we adjusted the brake shoes quite close to the wheels. After a while we found that for some reason or other quite a number of the bottom heads of the brake cylinders were knocked out. Investigation showed that we had adjusted the shoes so closely that the bouncing of the engine on the springs took up all the slack and pulled down on the brake gear sufficiently to cause the damage. By giving a greater amount of slack the trouble was overcome.

A matter that calls for incessant care and attention where air brakes are employed on freight cars is the adjustment of the lost motion of the piston connections. This is very often neglected, and hundreds of cars are constantly found in trains with the expensive brake useless when an engine is attached that has air for using the brakes. A new cause for making air brakes on freight cars inoperative was mentioned by Mr. P. Leeds at a meeting of the Southwestern Railway Club. He said: "On freight cars whose brake beams are suspended either from the car body or from the top bolster of the truck, the shoes will vary in height from the center of the axle according to the load in the car. This will make it almost impossible to adjust the slack properly, especially if the shoes are located much below the center of the wheels.

During a recent brief visit to the Bement & Miles works in Philadelphia we found numerous changes going on in the shops with a view of making the facilities of production equal the demand for the fine tools made by the firm. Besides the numerous tools that railroad men are so familiar with, we saw in different stages of construction some of the largest tools we have lately seen. They are building a lathe with 125 inches swing, with four carriages and ways 35 feet long. They are working on an enormous side planer that will operate on work 22 feet square. Another big machine which they have recently received an order for is a double-headed slotter of greater capacity than anything of the kind previously made in the shop. A tool of a similar kind just shipped is a three-headed slotter for locomotive frames. They have lately got up a new drill for locomotive frames, and also a special drill for connecting rods. The shops are all very busy, that devoted to the construction of steam hammers and boilermakers' tools being particularly pushed with work.

One of the most serious defects which have been encountered in truck brake gear has been imperfect hangers. Rigid hangers when used in connection with wooden beams are not satisfactory, because no lateral motion being allowed either at top or bottom something must yield when going around curves. The wooden beam is, however, quite strong vertically as well as horizontally and such action does not destroy it, whatever the effect may be upon the hanger. The various metal beams, however, are all constructed with the truss so disposed that the strength is nearly all in a horizontal direction, and very rigid hangers attached to the car body have proved rather destructive to these beams. Most of the roads are, therefore, using a hanger which has an eye in each end, and this has proved the most satisfactory where outside brakes suspended from the car body are employed. The expense of maintaining inside brakes is fully 75 per cent. less than for outside ones, for many outside beams are damaged by contact with locomotive pilots, buffing posts, etc. The Richmond & Danville Railroad has used metal beams on the inside of the wheels for more than two years, and is perfectly satisfied with the results.

The vagrant bully who delights to journey hither and thither all over creation with the box car for a chariot is often very troublesome for brakemen, who are inclined to question his right to free transportation. The trainmen are sometimes, however, equal to if not harder than the toughest vag. riding. A story comes from far Utah of some unusually exciting passages of arms that happened between a deadhead and the trainmen on a Union Pacific freight. John White was beating his way on the train and it is said that he threw Pat Taggart, a brakeman, off the train. When the brakeman was missed White was seized, beaten over the head with a revolver, kicked and cuffed until he was unconscious, and then thrown into the caboose. When he came to his senses a rope was placed around his neck, the end attached to the rear platform of the caboose, and while the train was moving at a high rate of speed White was thrown from the platform and was dragged along dangling to the end of the rope. By a superhuman effort the man succeeded in grasping the platform with one hand and loosed the rope with the other He then started for the mountains and was pursued by the train hands, who fired five shots from revolvers at him. Two of the shots passed through his right leg. Almost unconscious the man succeeded in eluding his pursuers and found refuge in a camp, where he was kept until he had recovered from his injuries. White has entered suit against the Union Pacific for $10,000 damages, and the company have had him arrested charged with murdering the brakeman.

The Baldwin Locomotive Works are engaged building 50 locomotives for the colony of New South Wales, and one of the engines has been finished and worked for some days on the Philadelphia division of the Baltimore & Ohio Railroad. The engine is intended for heavy passenger service, and is built about the capacity of the Baltimore & Ohio 10-wheelers but with modifications to suit the tastes of the New South Wales engineers. The engine has cylinders 21 × 24 inches and driving wheels 61 inches diameter. The boiler is straight and is 64 inches diameter and contains 275 brass tubes 2 inches diameter. The firebox is of copper, and staybolts of the same material are used. The engine has an extension smokebox, and a peculiar thing about her appearance is the smokestack, which is only about 30 inches high above the smokebox line. The dome is placed a little in front of the center of the boiler, and in front of the cab there is a manhole covered by an oval plate. There is no sandbox on the boiler, but there are four boxes placed under the running boards. The driving wheels are wrought iron. The engine has the American brake applied to the driving wheels, and has two 10½ Sellers improved injectors; Crosby safety valves, U. S. gland packing and the engine truck has wheels 36 inches diameter and a swing center. Ross shoes are used for the driver brake.

After making a few trips on the Philadelphia division of the Baltimore & Ohio, the engine was taken south to a division where there is a long, steep grade. The full train of a consolidation engine on this grade is 25 loaded cars, but the New South Wales locomotive pulled 30 cars without stalling.

How Iron Breaks.

Hundreds of existing railway bridges which carry 20 trains a day with perfect safety would break down quickly under 20 trains per hour, writes a British civil engineer. This fact was forced on my attention nearly 20 years ago by the fracture of a number of iron girders of ordinary strength under a five-minute train service. Similarly, when in New York last year, I noticed, in the case of some hundred girders on the elevated railway, that the alternate thrust and pull on the central diagonals from trains passing every two or three minutes had developed a weakness which necessitated the bars being replaced by stronger ones after very short service. Somewhat the same thing had to be done recently with a bridge over the river Trent, but the train service being small the life of the bars was measured by years instead of months. If ships were always among great waves the number going to the bottom would be largely increased.

It appears natural enough to every one that a piece even of the toughest wire should be quickly broken if bent backward and forward to a sharp angle; but, perhaps, only to locomotive and marine engineers does it appear equally natural that the same result would follow in time if the bending were so small as to be quite imperceptible to the eye. A locomotive crank axle bends but one-eighty-fourth of an inch, and a straight driving-axle a still smaller amount, under the heaviest bending stresses to which they are subject, and yet their life is limited. During the year 1883 one iron axle in fifty broke in running, and one in fifteen was renewed in consequence of defects. Taking iron and steel axles together the number then in use on the railways of the United Kingdom was 14,848, and of these 911 required renewal during the year. Similarly, during the past three years, no less than 228 ocean steamers were disabled by broken shafts, the average safe life of which is said to be about three or four years. Experience has proved that a very moderate stress, alternating from tension to compression, if repeated about 100,000,000 times, will cause a fracture as surely as a bending to an angle repeated only ten miles.

The American Railway Equipment Compny have on exhibition in their Chicago office bearings of Eureka tempered copper that have run over two years, having made 150,000 miles under an engine tender and have not worn to exceed $\frac{1}{16}$ of an inch either on the face or laterally.

In regard to the use of plumbago in molding as an aid to the production of sound castings, the Dixon Crucible Company of Jersey City says: Actual sales of plumbago show that barrels of it are now used in shops where pounds were formerly called for. Its use is becoming universal. The use of a plumbago facing absolutely guarantees to the casting a smooth surface and bright color. Caution is suggested when purchasing to obtain exactly the kind wanted for the different work. It can be said of plumbago as the Irishman said of whiskey, "None is bad, but some is better than others." One kind of plumbago is better applied by the shake-bag, and if the brush is used another kind will prove better. One preparation of plumbago will "sleek," another will not. Another kind is more useful for light castings, another kind for heavier work. Good plumbago will stand the heat, and will neither burn nor run before the molten metal. A wash of plumbago for cores, loam work, and dry sand castings is indispensable.

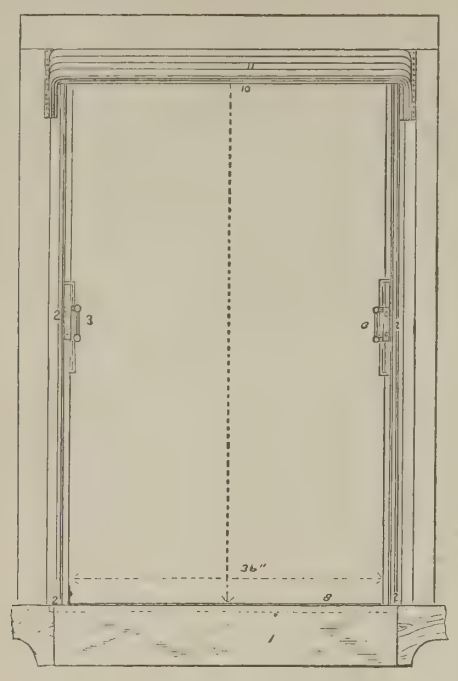


Fig. 1

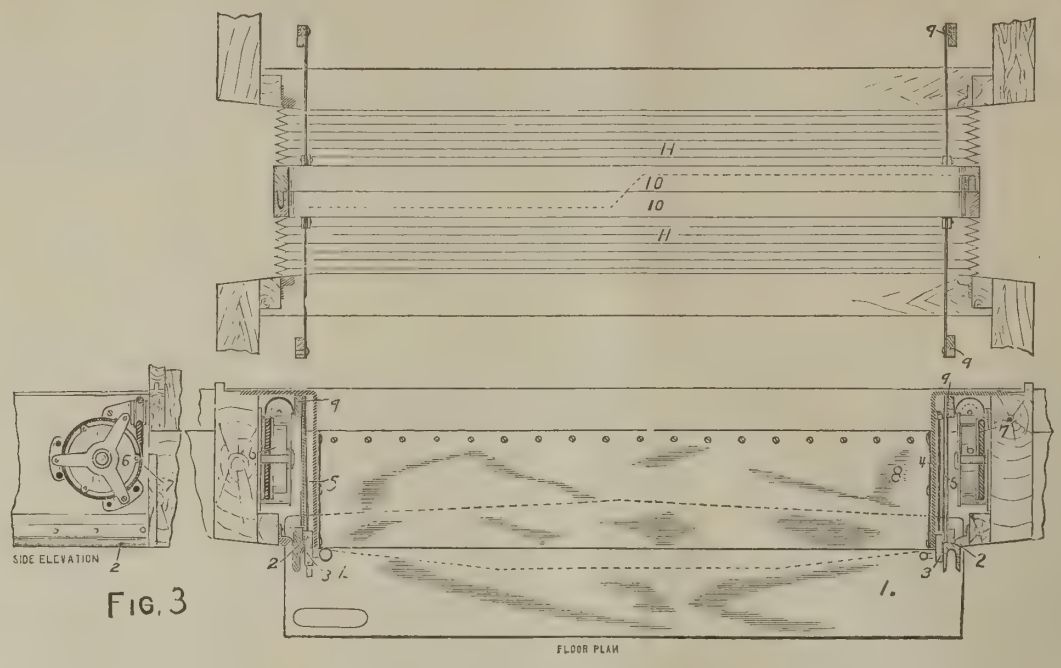


Fig. 3

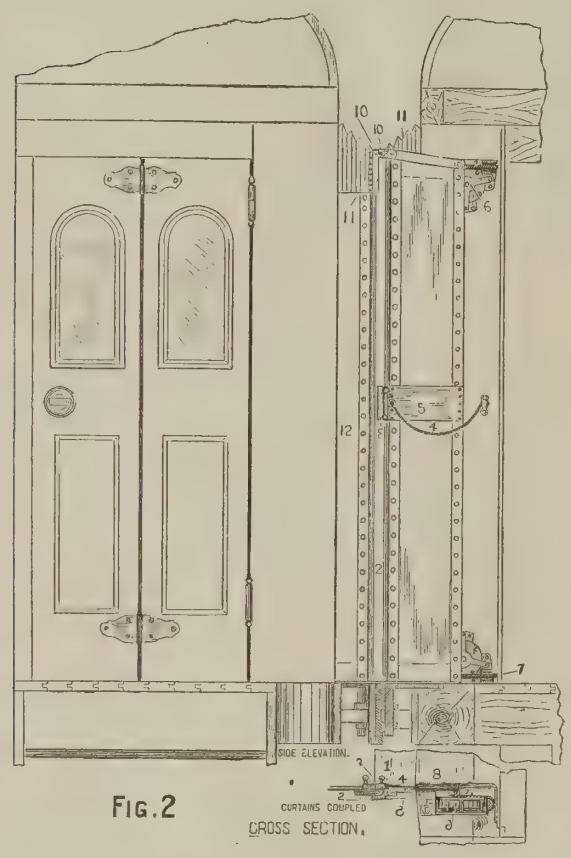


Fig. 2

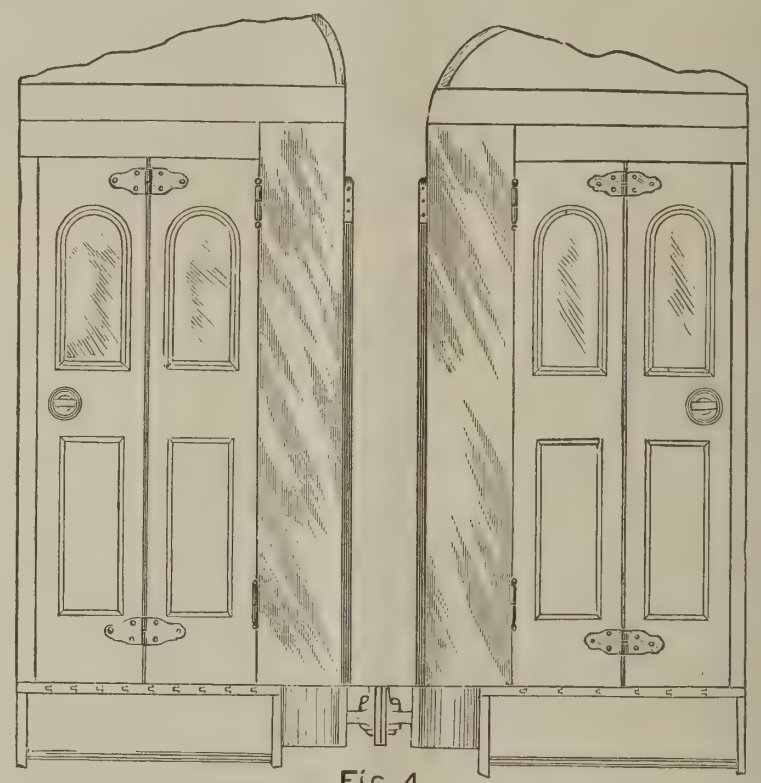


Fig. 4

NEW COWELL VESTIBULE.

The above design is intended to show the main features of a new vestibule for passenger cars. The main feature aimed at is to so construct the end of a car or coach as to make it convertible at will into either a vestibule or an open car. To accomplish this, the ordinary platform and roof projecting over the platform are supplemented with supports for the roof made to serve as door jambs, and double, or folding-doors provided for each side of the platform, similar to those now in use on vestibule cars.

This vestibule is designed also to be used with the Cowell buffer, or the continuous floor between cars, which is useful as well on the car when used as an open car (for safety and convenience) as when converted into a vestibule car.

In the cuts, Fig. 1 is an end view of car with vestibule and buffer.

Fig. 2 is a side view of vestibule, the car being used as a vestibule car, part of right-hand car cut away. The unlocking chord (4) shown here runs between the curtain and its housing.

Fig. 3 shows floor plan of buffer and vestibule parts. The upper part of this figure is a view of the hood, looking upwood from inside the vestibule.

Fig. 4 is a side view of the end of the car with the curtains open, or a view of the open car if the doors were also open.

It may be seen that this car, as an open car or coach, has the advantage over ordinary coaches, first, of the doors and jambs on the side which form a safeguard for all persons passing from one car to another, even when the doors are open or folded, because only a space of 12¼ inches (width of a single door) is left on the side, and only eight or nine inches (on a straight track) between the door jambs of one car to that of the other.

Second—In the continuous floor between the cars, which leaves no space or crack between moving cars into which man or child may step or catch even their toe. For air and ventilation this car will substantially equal the ordinary coach, but will have the finish and elegant appearance of "The Gilt-Edged Train," so called, on the Shore Line between New York and Boston.

Fig. 2 shows the end of the car converted into the vestibule. The taut curtain makes the connection between the cars on each side and the doors are closed. The taut curtain fills the space heretofore occupied by what is known as the "diaphragm" of the vestibule.

The conversion of the open car into the vestibule is accomplished by a simple process.

The numbers on the cuts are defined as follows: 1, buffer; 2, rim of curtain; 3, lock and handle; 4, unlocking chord; 5, lock strap; 6, curtain spring; 7, connection between curtains and spring; 8, floor plate; 9, back rim of curtain; 10 rim of hood; 11, hood; 12, curtain.

The curtain (12) habitually is drawn back by the curtain spring (6) into the recess in the door-jamb, the connections (7) being coiled around the spring. The curtain is, therefore, housed from dust, rain and from sight when not in use. To close the vestibule take hold of the handles of the curtain (3), draw them together and they become locked. This process is required twice, once on each side. The action of the hood, which could not well be shown on small cuts, is dependent on the action of the curtains; when the curtains are extended the hoods come together and are so locked as to become water-tight; when the curtains recede into their recesses the hoods also recede into a bellows folded at the top.

The rims (2) are metallic and in shape of a tongue and groove, and when caught together and locked become securely water-tight and air-tight. Indeed, this perfectly air-tight and water-tight connection is one of the strong claims made for this vestibule.

The curtains are surrounded with a metallic rim, which serves to hold them in place and support the hood, while being flexible laterally to accommodate themselves to the curves of the road.

When the vestibules are in use and it is desired to convert the car into an open one, the only requirement is to unlock the curtains, when each recedes into its recess. Whenever the cars are uncoupled or if ever accidentlly broken apart, the unlocking chord of the curtain (4) when drawn taut automatically unlocks the curtain coupling, and then the curtains resume their positions within the recesses.

The lock (3) is made much like a spear head with two barbs; the barbs on one curtain locking into shoulders on the other. Whenever the unlocking chord is drawn tight it causes the barbs to draw together or close up so as to leave no barbs to catch; the curtains then being of course unlocked.

The claims of this vestibule are:

1. That it may be used or not, at will, depending upon the climate and the weather.

2. That it is much lighter on the end of a car than the vestibules now in use, with heavy face-plates, and much cheaper.

3. That its water-tight and dust-tight connection is positive and sure. While it will require a little time, one minute, to draw out the curtains and lock them, some such time as is required for coupling the air-hose, yet when that is done you have a continuous, crackless, dust-proof vestibule.

4. That whenever the connection is broken, the curtains and hood automatically care for themselves, recede into their places and leave nothing offensive to the eye. This vestibule is manufactured by The Cowell Platform & Coupling Company, of Cleveland, Ohio, which is prepared to furnish them, we understand, or to license railroads to construct them.

The Chicago & Northwestern Railway have fitted up some trains for lighting with gas after the Pintsch system.

Jenkins Brothers, makers of valves, packing and all other steam engineering fixtures, have put on the market Dunton's automatic water gauge valve, which is the most successful device ever used for automatically closing the gauge cock openings when a water glass breaks. In connection with this and other water gauges they use rubber coverings for the handles, a non-conducting material which enables an engineer to handle the valves without burning the hands.

The Eureka Tempered Copper Company, of North East, Pa., have arranged with the American Railway Equipment Company, of New York and Chicago, to act as their general agents with railroads, and in all territory west of the Mississippi River. With this addition to their canvassing force, and the trade already established, they will be kept busy during the coming year. They report large orders during February from the Edison General Electric Company, the Wenstrom Consolidated Dynamo and Motor Company, the Electro-Dynamic Company, the National Electric Manufacturing Company, and the Baxter Electric Motor Company, for their tempered copper, and in finished work for electrical central stations they received upward of one hundred orders in the month of February alone.

The Bosworth Pump Governor, Feed-Water Regulator, Pressure Regulator, Feed-Water Recorder and Feed-Water Regulator and Recorder.

Among the many valuable inventions which Mr. Charles B. Bosworth, of Boston, has patented within the last few years, those which appertain to the control of the action of steam pumps in the various and important duties which they perform are very interesting and valuable and must take high rank as practical machines, and be deemed indispensable accessories to all well equipped steam plants, as great economies in the generation and employment of steam are secured by their use. When these inventions become better known, they will be required in many industries already established, while, through the wide range of their application and their great possibilities, new processes and industries will be developed and the field of their usefulness thereby enlarged.

THE BOSWORTH PUMP GOVERNOR.

The Bosworth pump governor (Fig. 1, section; Fig. 2, elevation) is actuated by two positive forces, one compressed air, the other a spiral steel spring; both are certain in their

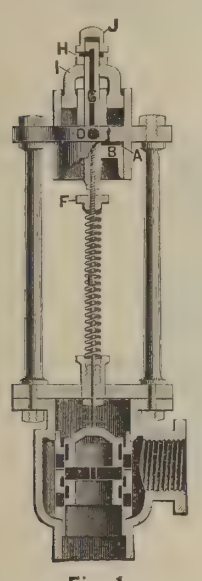


Fig. 1.

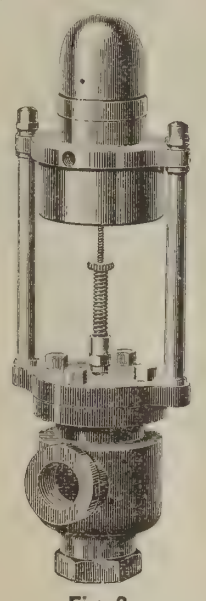


Fig. 2.

action and easily adjusted to the work required of them. The power of the spring is constant, while that of the air is made to vary from nothing to double that of the spring. As these forces act in opposition—the spring to open the throttle valve and the air to close it—it is obvious that the spring can be effective only when the air pressure in the cylinder is less than its own; and that the air can be effective only when its own pressure exceeds that of the spring; and it will be seen that these conditions are obtained and repeated at regular intervals, according to the work required of the steam pump.

An air pump (not here shown), connected by proper mechanism to the steam pump to be worked by it, pumps air into the cylinder, *A*, through a pipe connected at *D*; when sufficient pressure is accumulated therein, the piston, *B*, which is directly connected by the rod, *F*, to the throttle valve of the steam pump, is forced downward, thereby compressing the spiral spring on the rod and closing more or less the throttle and consequently retarding the pump (and with it the air pump). A small passage, *G*, with adjustable orifice, *H* for the escape of air is provided, through which the pressure in the cylinder is gradually reduced, and when the air pressure becomes less than that of the spiral spring, the latter forces the piston upward, thereby opening the throttle more or less and consequently accelerating the pump (and with it the air pump).

When a regular and uniform speed of the steam pump is required, it can be obtained by modifying the area of the passage, *G*, by the adjusting nut, *J*. When once regulated the steam pump will continue to run without variation, regardless of the changes of steam pressure, or load on the steam pump. Its action is positive and direct, and so sensitive that it will control the steam pump within two strokes in case of accident.

THE BOSWORTH FEED-WATER REGULATOR.

Fig. 3 shows a steam boiler with the Bosworth feed-water regulator in position.

This apparatus consists of the air pump operated by the steam pump, *O*, the pump governor, *K* (as above described except that the orifice *H* is closed and the escape of air from the cylinder is controlled by a valve operated automatically), and the regulator, *R*. This regulator (see Fig. 4 for larger cut) has boiler connections in common with the water gauge, *S*, and is interposed between it and the water column, *W*, conditions which secure the same fluctuations of water level as take place within the boiler, and being outside of it, the water contained is cooled by radiation; a fact of great importance in this device. The regulator may be described as a half inch brass pipe having a rectangular return-bend, the horizontal legs of which are about 8 inches long and 2 inches apart, all in the same plane. This return-bend is located so that the upper or steam leg, *Q*, shall always be filled with steam, while the lower or expansion leg, *P*, shall have its horizontal diameter level with the prescribed water line, to be alternately filled with hot steam or cooler water as the latter slightly falls or rises by reason of its evaporation and the prompt supply afforded by this device. Below the expansion leg is an adjustable steel rod, *N*, connected at one end to the upright part of the regulator and at the other end to the lever which controls the valve, *M*, in the air pipe leading to the governor.

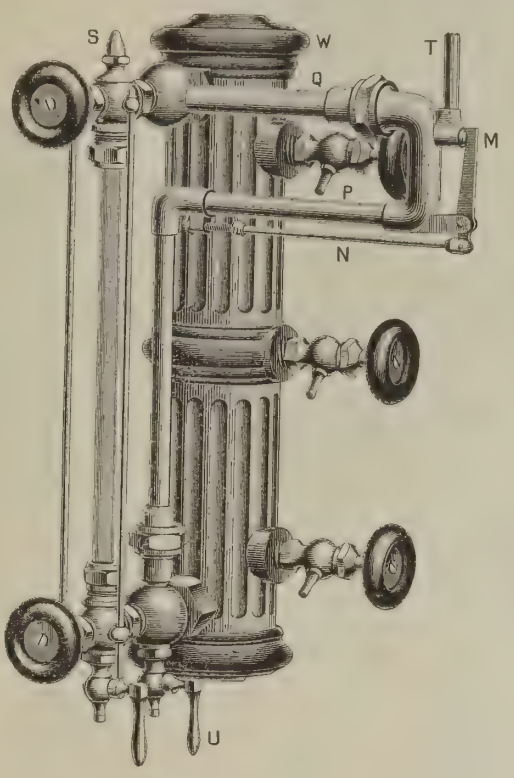


Fig. 4.

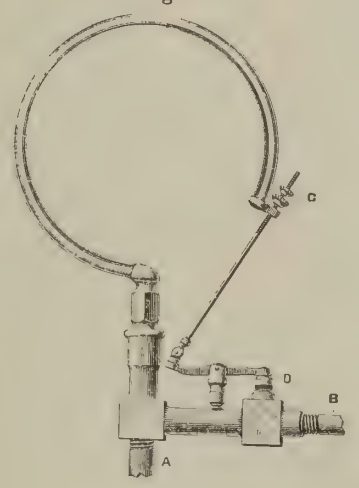


Fig. 5.

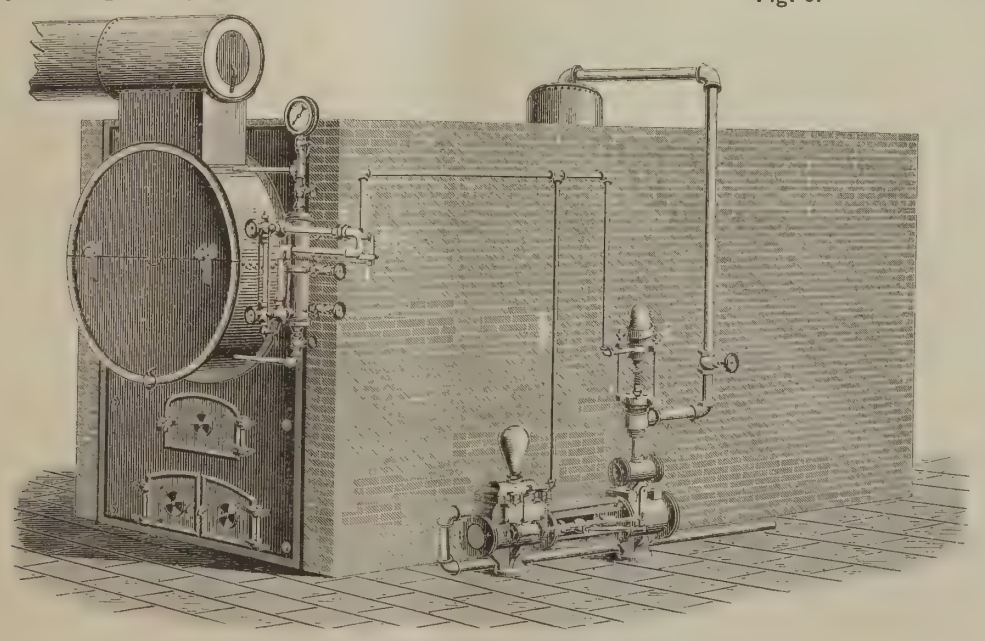


Fig. 3.

To understand the automatic operation of the apparatus above described and illustrated, let us suppose that the water in the boiler is at its highest point, at which time the expansion leg is full of water, and the air valve is closed; the pressure in the cylinder has forced the piston down, compressed the spiral spring, closed the throttle and stopped the pump. This condition of things lasts but a moment; evaporation is constantly going on in the boiler and lowering the water, which gradually settles out of the expansion leg, and its place is instantly filled by steam from the steam leg. The live steam being much hotter than the water which it has displaced, expands the pipe, which acts on the lever of the air valve and slightly opens it; thus relieving the pressure in the cylinder of the governor, so that the spiral spring may *react* and open the throttle by which the pump is started. The action of the pump continues until the water is again carried to its highest point, filling again the expansion leg with cooler water, which contracts it and closes the air valve, so that pressure is again accumulated in the cylinder of the governor, by which the piston is forced downward, the spiral spring compressed, the throttle closed and the pump stopped; thus completing one round or alternation, and this automatic action is continued as long as evaporation takes place and power is generated in the boiler. This apparatus is susceptible of very fine adjustment by means of the rod, N, so that the rise and fall of water in the boiler shall not exceed one-fourth inch above or below the prescribed water-line.

THE BOSWORTH PRESSURE REGULATOR.

This apparatus consists of the pump governor (applied to a steam pump) as last described, in connection with another instrument, which, acted upon by fluid pressure within a receiver, accumulator, or chamber of any kind, will close or open an air valve. (See Fig. 5.) This instrument consists of a Bourdon tube spring opening into the pressure chamber at *A*. Its free end is connected by an adjustable rod, *C*, to the lever of the air valve, *D*, opening into the pipe, *B*, which leads to the cylinder of the pump governor. It is well known that pressure within a Bourdon tube spring tends to *straighten it*, and the movement of its free end when under varying pressure is availed of in this device to open and close the air valve, to regulate the pressure in the cylinder, and so *govern* the action of the steam pump. This instrument is susceptible of very fine adjustment, by proper tension on the rod, *C*, and the spiral spring, *F*, so that pressure can be maintained at any desired point. The operation of the pressure regulator is substantially the same as that of the feed-water regulator, and need not be again described. In both the things to be maintained—the water line in the boiler and the pressure in the chamber—by their very *slight variations* are ingeniously made to initiate forces which are able to *control* them, to a degree of perfection which has never been attained before.

THE BOSWORTH FEED-WATER RECORDER.

By means of a small float-chamber communicating with the steam and water spaces of a boiler and suitable clock-work, the Bosworth feed-water recorder registers on a paper dial the rise and fall of water in the boiler to which it is attached.

THE BOSWORTH FEED-WATER REGULATOR AND RECORDER.

This apparatus is a combination of the feed-water recorder last mentioned and the feed-water regulator previously described, and is for the double purpose of maintaining an even water line in the boiler, and recording this result on a paper dial.

The importance of a constant water line in a steam boiler is well understood, as is also the difficulty of maintaining it in the ordinary way, even by the most careful engineer. Low water and a low fire are as likely as not to occur at the same time, and then lower pressure and lessened power are inevitable, the result of which is slackened speed of machinery, diminished product and actual loss to the establishment. All this is avoided by the use of the Bosworth apparatus, whereby the water line is so evenly maintained that the firing can be reduced to a system, by which a steady speed of machinery and regular product are assured. By an even water line and systematic firing a considerable saving in fuel is effected, and for the same reason the life and strength of the boiler are preserved, and its durability greatly prolonged. To these economies may be added the more important consideration of *safety* and *security* to life and property which are afforded by the use of this apparatus.

These valuable inventions are fully covered by letters patent of the United States and Great Britain. They are controlled exclusively by the Crosby Steam Gage & Valve Company, of Boston, Mass., by whom they are manufactured and sold. The same inventor is still exploring in this prolific field of steam engineering, and the fact that he has just completed a most successful line of experiments with a new device for feeding—by a single pump—a series or battery of steam boilers, without regard to the different and varying pressure in each, is a promise that within a short time other useful and interesting matters of this kind may be ready to publish to the world.

Inquiries or other correspondence relating to these inventions should be addressed to the Crosby Steam Gage & Valve Company, 93 Oliver Street, Boston, Mass.

The first railroad in the world to operate a whole system of trains in which the temperature is automatically regulated whenever steam heat is used is the Delaware & Hudson Canal Company. Its belt line trains between Albany and Troy, leaving Albany at half after each hour, are all thus equipped with the Consolidated Car Heating Company devices. The temperature regulator has been in service since January 1st, 1891, and the directions for its use practically are: Turn on steam to cars from the locomotive and leave every valve on the train entirely alone. The interior temperature of the cars with ventilators well open will shortly after steam is turned on rise to 70 degrees and remain there, no matter what the outside temperature may be. This is the most notable advance of recent years in car heating by steam from the locomotive.

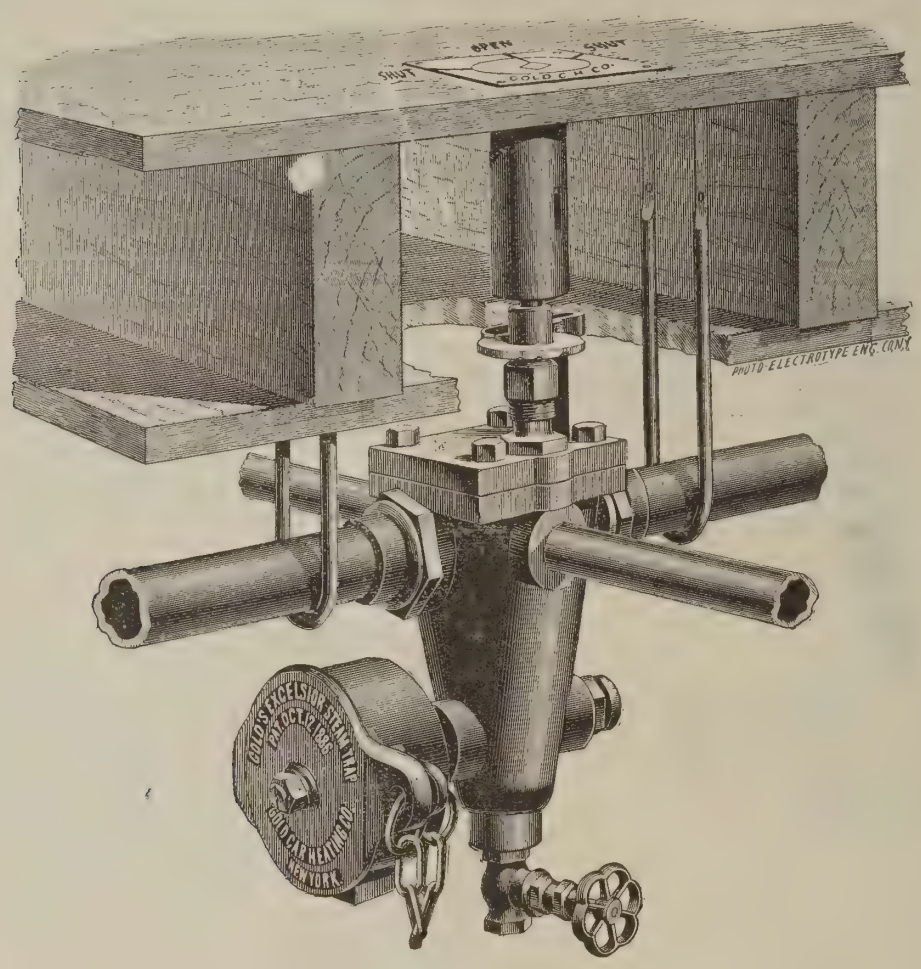
The Deoxidized Metal Company, of Bridgeport, Conn., have been compelled owing to their rapidly increasing business to again enlarge their foundry.

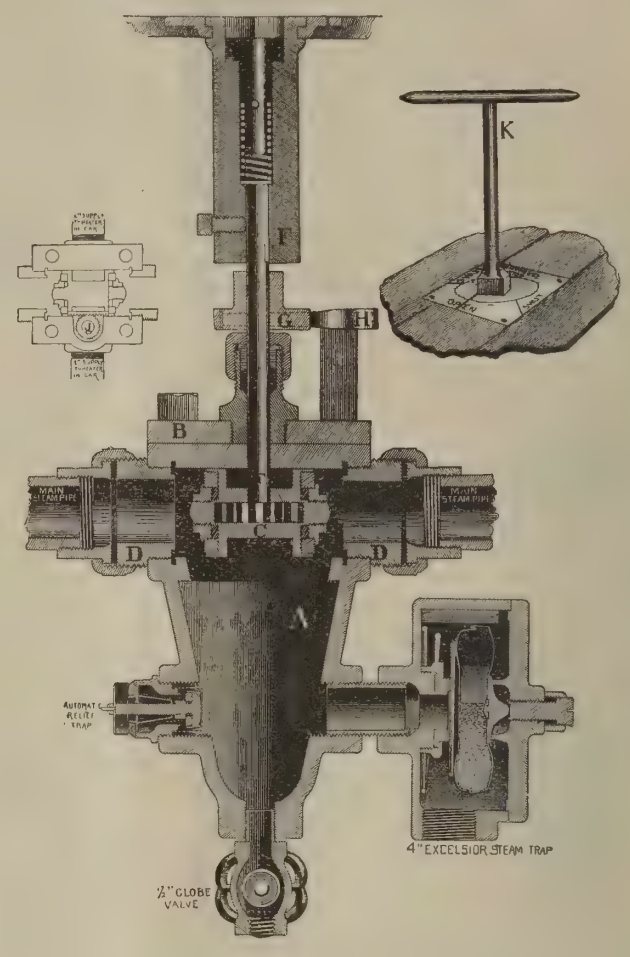
Train Pipe Valve for Car Heating.

In the accompanying illustrations we show a sectional and perspective view of a train pipe valve recently placed upon the market by the Gold Car Heating Company, of New York. The purpose of this valve is to do away with all cocks or valves within the car, and to regulate the entire heating apparatus by the one mechanism. Referring to our illustrations the main body, *A*, is of cast iron, and has seven openings. It has a cover, *B*, bolted upon it, directly beneath which is the piston valve, *C*. The axis of this valve is horizontal and coincident with the train pipe. Its motion is in the direction of its axis and each end is provided with a composition ring which seats against the inner faceof the adjacent pipe union *D*, when the valve is at either end of its travel. It is operated by a rack upon its side, into which meshes a small pinion on the vertical spindle which extends up to the car floor. This is shown clearly in the small view in the upper left hand corner of Fig. 1. In the large sectional view shown in Fig. 1, the valve is in a middle position so that the steam will pass through it and into the train pipe beyond. In that position it also permits steam to pass into the pipes leading to that car. By turning the spindle until the valve is hard against one seat the steam is shut off from the train pipe beyond, though still open to the circulating pipes of that car. A reversal of this position would accomplish the same results if the engine was at the other end of the train.

From the perspective view, Fig. 2, it is seen that there are two pipes leading into the car. These can both be used where double circulation is desired, or one only may be employed and the other opening plugged. Below these pipes are three openings, one for the Gold "Excelsior" steam trap, a second for an automatic relief trap, and the third for a small valve by which the whole apparatus can be blown out should dirt of any nature get into it. In a plate in the car floor lines are cut and designated so that the operator can adjust the valve to the proper position with certainty. The sleeve, *F*, fits this plate and is fastened to the spindle by means of a set screw as shown. On the spindle there is also a collar *G*, whose edge has slight depressions, into one of which the spring, *H*, engages at each of the three positions of the valve, with sufficient force to require the use of the key *K* to move the valve. This prevents its shifting its position by the jar or vibration of the car.

The valve is the design of Mr. E. E. Gold, of the Gold Car Heating Company, and he is now applying it to a number of cars in the East.





TRAIN PIPE VALVE FOR CAR HEATING.

The Westinghouse Machine Company wish all concerned to know that the financial troubles of the Westinghouse interests is confined to the Electric Company alone, and that it is in no manner affected by them. On the contrary, the Westinghouse Machine Company was never in a more prosperous and satisfactory condition than it is to-day. Instead of curtailing its operations, this old reliable institution is still further increasing its capacity as rapidly and as much as it can. New tool and store rooms are just approaching completion, and it is hoped by the management, during the coming spring or summer, to be able to add complete new erecting and testing shops fitted with large power cranes and all modern improvements, and which shops will have a producing capacity twice as great as the present ones. To those in want of steam engines, as well as to those interested in the development, progress and enterprise of American manufacture, we suggest a careful perusal of the advertisement of the Westinghouse Machine Company, which appears elsewhere in this issue.

The Samson Cordage Works, of Boston, have changed their offices to 115 Congress Street, Boston. They have been making several improvements in their card room, besides buying new machinery, which will largely increase their product. They are making the best yarns, and to this they give the credit for the success of the "Samson" cord.

The Grilley Company, of New Haven, Conn., are manufacturing screws of all kinds especially adapted for use in cars. They are doing a large business and have the names of a number of car builders and railroad companies upon their books.

The proprietors of the Leach sand feeding apparatus have made some improvements on the device lately which enable the engineer to regulale the supply of sand with still greater nicety. This sanding apparatus is becoming rapidly popular. The demand for it is so great that the makers have difficulty in keeping up with their orders.

We have received from the Diamond Machine Company a handsome little book on "Electricity and its Application to Electro-Plating." The book will be found of the greatest service to persons practically interested in electro-plating matters. We understand that it will be sent by the company to any of their patrons.

A material for preserving tin, car and all building roofs from rust, action of acids and deteriorating influences, in fact doing away with the necessity of future painting, has recently been put on the market by the Lee Composite Manufacturing Company, of New York. There is evidently a large field for such a material, if it can be furnished cheaply. It is also claimed to prevent the rusting and pitting of steel and iron in the water space of the tenders.

The American Railway Equipment Company are using Eureka tempered copper for journal bearings in connection with their Stearns roller wedge, making the bearings M. C. B. standard except that they are made ½ inch instead of 1 inch thick, the usual standard. Owing to the great strength imparted to the copper by the Eureka process of tempering without alloys these ½ inch thick bearings stand 190,000 pounds to the square inch under compression, or more than ordinary brasses. wear three or four times as long and they never heat or injure the journal as they possess anti-frictional qualities never before obtained in any bearing metal.

The American continuous drawbar, owned by the American Continuous Drawbar Company, of Aurora, Ind., was applied during the three months ending December, 1890, as reported by the various car companies who used it to close upon four thousand new cars. The following were some of the cars lately eqnipped with this drawbar: 500 Gardner stock cars, 200 Swift refrigerator cars—Michigan Car Company; 500 Baltimore & Ohio, 300 Baltimore & Ohio Southwestern—South Baltimore Car Works; 100 Union Railway Transit Company, 100 Lake Erie & St. Louis, 100 Chicago, Winona & Minneapolis, 200 Evansville & Terre Haute, 25 East St. Louis & Chicago—Terre Haute Car Company; 200; St. Louis, Alton & Terre Haute—Litchfield; 200 Choctaw Coal & Railway Company, 1,000 Baltimore & Ohio Pullman 200 Mexican Northern—St. Charles Car Company.

The Brown & Sharpe Manufacturing Company inform us that they are building a four-story addition to their establishment, 100 × 56 feet. The new building will be fireproof and finished in the most approved style with every convenience for the health and comfort of the workmen. It will be devoted to the manufacture of small tools and instruments for accurate measurement.

The Gum-Elastic Roofing Company, of New York, handle a material which ought to be better known than it is to railroad men. Their roofing not only makes an excellent light and durable covering for buildings, but they handle a cement which is highly serviceable for repairing breaks or nail holes in roofs. The substance contains no tar or cheap oils; is about the consistency of good putty, ready for applying with knife, stick or trowel; is very adhesive, perfectly elastic, does not injure water from moment of application, and cannot be washed off. This cement does not crack, peel off or blister in hot or cold weather, does the same service and lasts longer than solder. After it is once applied, a skin commences forming over it, which soon becomes tough and hard. This process continues until the whole assumes a toughness like sole leather, and eventually becomes as durable as the article tself.

Our Directory.

Atchison, Topeka & Santa Fe.—Mr. Geo. J. Hartman has been appointed superintendent of the western division, vice W. A. Drake, resigned.

Baltimore & Ohio.—R. W. Baxter has been appointed superintendent of the Ohio Division, vice Geo. T. Jarvis, resigned.

Boston & Maine.—Louis C. Todd has been appointed master mechanic of the Passumpsic Division, vice A. M. Stone, resigned.

Chicago, Rock Island & Pacific.—C. M. Leonard has been appointed master car builder of the Illinois Division, vice Samuel Pullman, resigned.

Cincinnati, Wabash & Michigan.—N. P. Ramsey has been appointed general manager.

East Tennessee, Virginia & Georgia.—W. R. Beauprie has been appointed superintendent of Georgia Division.

Florida Central & Peninsular.—M. J. Rogers has been appointed master mechanic.

Kentucky & Indiana Bridge Co.—W. R. Woodward has been appointed general manager.

Meadville & Linesville.—T. J. Blair has been appointed general manager

Mexican National.—Thomas Milan has been appointed superintendent of M. P. J. L. Williams has been appointed superintendent San Luis Division.

Milwaukee, Lake Shore & Western.—John Hickey, master mechanic, has resigned.

Newport News & Mississippi Valley.—E. Randolph has been appointed superintendent.

Northern Pacific.—John Hickey has been appointed superintendent of motive power.

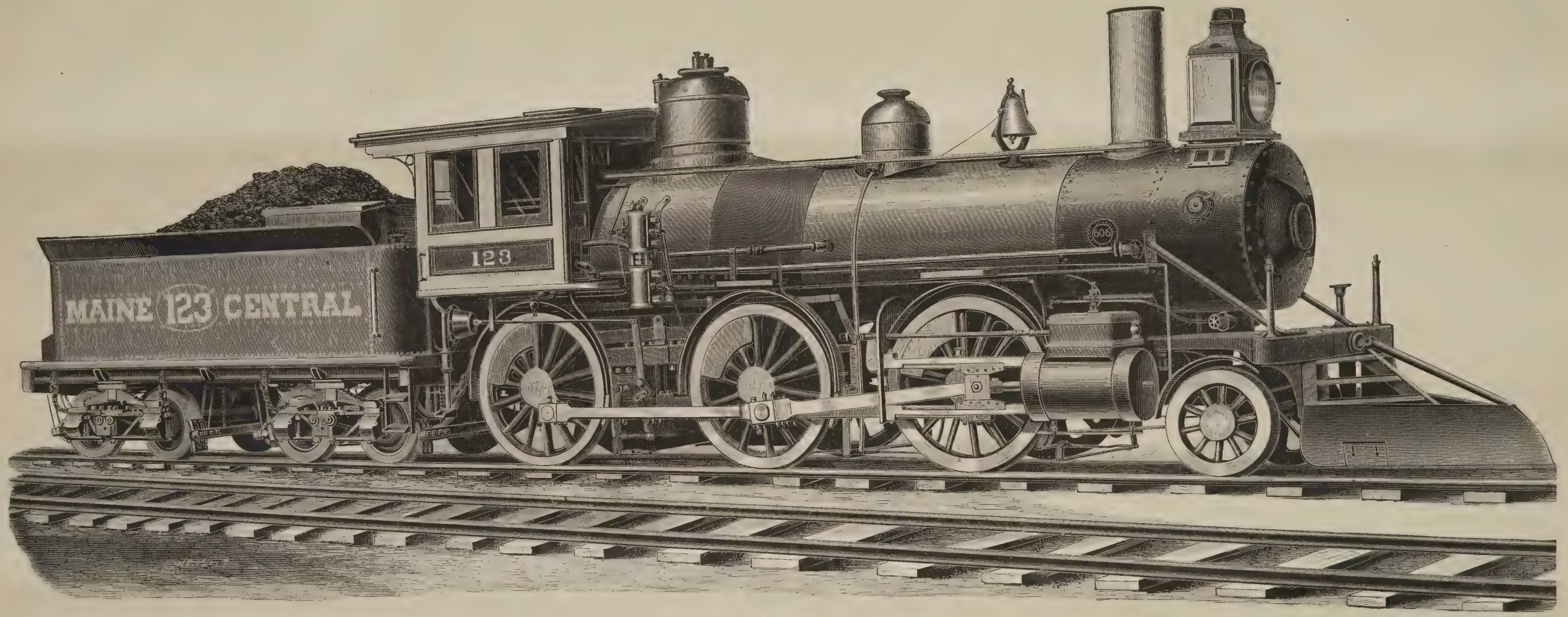
Union Pacific.—E. E. Calvin has been appointed superintendent of Idaho Division, vice W. L. Rider, resigned.

Western & Atlantic.—J. A. McCullom has been appointed superintendent, vice R. A. Anderson, resigned.

Employment Wanted.

I have had 12 years' experience in the car department, and five years as Master Car Builder; best of references. Address "B," at office of this paper.

Wanted.—A man capable to take charge of blacksmith and machine departments in freight car shop. None but experienced men need apply. Address W. C. A., officeof this paper.



MAINE CENTRAL MOGUL LOCOMOTIVE.

Designed by Mr. Amos Pilsbury.

NATIONAL CAR AND LOCOMOTIVE BUILDER

MAY, 1891.

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The Orange Belt, of Florida, are in the market for 200 freight cars.

The Savannah, Americus & Montgomery are in the market for 200 freight cars.

The name of the Time Convention has been changed to the American Railway Association.

A published report that the Central of New Jersey has ordered 30 passenger cars is not true.

The Houston & Texas Central have ordered ten ten-wheeled locomotives from Paterson.

The Boston & Albany have ordered the attachments for putting automatic couplers on 5,000 cars.

The Silver Springs & Ocala are about to order 100 cars for their phosphate business, which is increasing rapidly.

The Chicago, Burlington & Quincy lately discharged 120 men from the car shops at Aurora in order to reduce expenses.

The Wheeling & Lake Erie have placed an order with the Pittsburgh Locomotive Works for three switchers and six ten-wheeled locomotives.

The Fitchburg are building four new passenger cars, and they have begun work on 300 new freight cars, all the work being done in their fine shops at Fitchburg, under Mr. Marden.

Rogers Locomotive Works are working on an order of eight locomotives for the Columbus, Shawnee & Hocking Railway. They are also building 18 locomotives for the Nashville, Chattanooga & St. Louis.

An order for 20 locomotives from the Big Four, which for several weeks excited the ambition of all the locomotive builders, has been captured by the Brooks Locomotive Works. The Wisconsin Central lately placed an order with Brooks for ten engines.

When the secretaries of the Master Car Builders and Master Mechanics' associations applied to the Trunk Line Association for reduced rates for persons attending the conventions, they were asked to give bonds guaranteeing to redeem at full fare any tickets found in the hands of scalpers.

The fourth locomotive belonging to the New York Elevated Railroad to have facets milled on the driving wheels according to the Swinerton prescription has been put in service, and the facets wore off during the first trip. Traveling Engineer Rouch, who is reported to have become the foster father of the invention is said to spend his nights on the structure looking for the spots lost by the engine.

A report is in circulation that every person occupying a room for himself at the Stockton Hotel during the coming convention will be required to pay $6 per day. The agreement made with the Committee of Arrangements by Mr. Walton, proprietor of the hotel, was that all persons attending the convention should be charged $3 a day. Nothing was said about an exception being made for those who occupied rooms singly, and Mr. Walton will not be permitted to violate his agreement.

The Michigan Central people have lately turned out a curious sort of car from their works at Detroit. The company has been lately engaged in double-tracking their lines, and it has required a large force of men to shovel back the earth after it was dumped off the cars. Mr. E. D. Bronner built a car with a side operating device which spreads the earth and moves it to the edge of the fill. The car is handled by a locomotive and performs as much work as three hundred men, and leaves the earthwork in better shape.

What is declared to have been the highest speed ever recorded of a railroad train was made by a special train carrying Mr. Jay Gould from Council Bluffs to Chicago over the Chicago & Northwestern Railway last month. The train made an average speed of 50 miles an hour throughout the whole run, including stops and delays, which raised the average running speed to about 65 miles an hour. Spurts attaining a speed of between 70 and 80 miles an hour were common, and for a short distance the speed is said to have reached 102 miles an hour, the fastest on record.

The railroad companies have at sundry times made emphatic protests against the illegal conduct of certain employés who attempted boycotting railroad companies with which they had strained relations. The leading railroads in the country have not, however, hesitated to enter into an agreement to boycott the Chicago & Alton because that company would not agree to cease paying commission on the sale of tickets. It seems to be a very foolish business, to say the least of it, and we are much mistaken if it does not eventually act as a boomerang upon those engaging in it.

In a report of a committee on car heating, submitted to the Time Convention held in New York last month, the information was given that "roads controlling 45,000 miles, or 28 per cent. of the mileage of the country, are testing continuous heating, and have made substantial progress, so that 'on the whole, the committee believes that at no remote period a solution of the problem will be had.' The committee cannot make any final recommendation, 'nor would an elaborate analysis be of any value at present.' It reports progress, and will be persistent in its efforts to get information from members and put it in available form."

The Schenectady Locomotive Works turned out 35 engines in March and 33 in April. Those built during the month of April going to the following roads: Four 18 × 24 six-wheel switchers to the Fitchburg; one 17 × 24 Forney to the Erie & Wyoming Valley; six 18 × 24 ten-wheel passenger, four 19 × 24 ten-wheel freight, and five 17 × 24 six-wheel switchers to the Chicago & Northwestern; six 18 × 24 ten-wheel passenger and three 17 × 24 six-wheel switchers to the Cincinnati, St. Paul, Missouri & Ohio; two 16 × 20 narrow-guage twelve-wheel freight to the F., & M. V.; two 20 × 24 consolidation freight to the Chicago E. & Eastern Illinois.

The Chicago & Northwestern Railway people are getting some new furniture cars built. They are unusually large, being 40 feet long and of the same width as the standard box car. They are equipped with air brakes, vertical plane couplers and the large size of the M. C. B. axle. Decided improvements have lately been made in the blacksmith shop of the car works. Gas furnaces have been introduced, two new Bradley hammers have been put to work, and a great many new formers have been made. In one respect this shop is still behind, for they do their forming under a hammer; but they will no doubt find out in time that the bulldozer is the tool for doing that kind of work economically.

In regard to an item that appeared in our columns last month about two coaches having been burned up on the Cincinnati, Wabash & Michigan Railroad, Mr. N. P Ramsay, general manager, writes: "We have investigated so far as we are able, and very much doubt that the lamp exploded. In fact, I do not believe it did. It is barely impossible that a match, or the head of a match, was dropped into the oil cup, which may have taken fire and caused the loss; but I am skeptical on even that. I was one of those fires that will occur, and the man in charge must give an excuse, but there is nothing in the investigation that would throw very much light on the cause, and it would never be located."

The writer recently rode on a locomotive belonging to the Michigan Central pulling the Chicago limited express. The engine was of the eight-wheel type, with cylinders 18 × 24 inches and driving wheels 66 inches diameter. The cars were six in number, and weighed 529,300 pounds empty. The engine and tender weighed 200,000 pounds in working order. This made a train of 364 tons to be moved. The engine kept the train speed up to 50 miles an hour pretty comfortably, but it was almost impossible to get her running faster except in descending grades. It took a pull of about five miles on the level to raise the speed from rest to 50 miles an hour. The engineer spoke with envy of the performance of the compounds in hauling express trains.

The Great Northern is said to be so short of motive power that the business is suffering; but President Hill cannot bring himself up to the point of ordering new locomotives, although in the visions of the night he is said to indulge in the luxury of ordering 100 new engines in a lump, It is even asserted that he has said when awake that he intended to order a big lot of engines soon, but when any enterprising supply man solicits the purchase of his goods for the locomotives he is promptly silenced with the assertion that there is no thought of ordering anything new, not even a hand car. Some people who profess to know Mr. Hill's ways, say that he is holding off on ordering as long as he can to enjoy the pleasure of keeping supply men and locomotive builders on the ragged edge.

A bill has become law in Nebraska which provides that it shall be unlawful to put into use in that state any new car or cars that have been sent to the shop or shops for general repairs, or whose draft rigging has to be repaired with a new draw-bar or bars that are not equipped with safety or automatic couplers or drawbars such as shall not necessitate the going between the ends of the cars to couple or uncouple them. After Jan. 1, 1895, it is made unlawful to use in transportation of freight or passengers any car that is not equipped with such automatic couplers. It will also be unlawful to use any locomotive in that state after May 1, 1892, that is not equipped with an efficient driver brake, or to run trains after Jan. 1, 1895, that shall not have in them a sufficient number of cars equipped with power brakes so that the engineer can control the train. The penalty is a fine for each offense of not less than $500, nor more than $1,000.

During moist weather the portions of Boston that are crowded with electric wires become so badly charged with electricity that it is dangerous to handle any conductor of electricity that has connection near the wire. Severe shocks are experienced on touching the wet telegraph poles. A well-known railroad man lately described a rather startling scene which he witnessed that was caused by the diffusion of electricity during wet weather. While he was in a barber's shop on a rainy evening one of the men went out to pull up the awning. On taking a hold of the wet rope the man was struck down as if he had sustained a stroke of apoplexy. Great excitement ensued. They carried the man into the shop and sent for a doctor, and in the meantime another barber went out to pull up the awning as it was getting dark, and he no sooner took hold of the rope than he also was knocked down insensible. Both men recovered and were none the worse of the shocks they received, but there is great reluctance among the tonsorial artists to handle the awning rope when it is wet or dry.

In the latter part of March there was a severe snowstorm in Kansas which blocked the tracks of the Atchison, Topeka & Santa Fé and of the Missouri Pacific at a point where the two lines run parallel. The Missouri Pacific people were out bucking the snow with a big push plow, and they got stuck in a small cutting that was filled up with snow. When they were digging the plow out, the rotary belonging to the Atchison, Topeka & Santa Fe came along and scooped the snow out of the cut belonging to its own tracks. By an oversight the man in charge of the rotary had the delivery hopper set to the Missouri Pacific side, and the snow bucking train belonging to that road was nearly ruined by the avalanche of snow poured upon it from the rotary. All the glass in the engine cab was broken and the cab filled solid with snow. The caboose was in a similar condition. When the damage done was perceived the rotary people stopped and made ample apologies, then they helped to clean out the extra obstructions they had deposited, and good feeling was re-established between the two companies. Had this not been done all concerned firmly believe that it would have led to a financial duel between Gould and Manvel.

A Bird Stopped the Train.

Uncle John is one of the oldest and most reliable passenger engineers on a Northwestern road, but he is of a nervous temperament and his habits on the engine are fidgety and impetuous. He has particular aversion to the striking of stock, and is constantly on the watch for stray animals. The habit of watching for stock has so grown upon him that he seldom sits when running, but stands clinging to the reverse and throttle levers keeping the closest scrutiny on both sides of the track. When a rabbit jumps out of the bushes his impulse is to shut off and apply the air, under the impression that the son of a cow is tempting destruction.

Years ago John Burns, who is now traveling engineer on the same road, went on firing for Uncle John Burns in those days was a romantic youth, with an eye for the beautiful and the romantic in nature. One day h observed a remarkably pretty red bird light on a twig at the side of the track. A thing of beauty was a joy to John that he liked to share with others and he called out, "Uncle John, look at that red bird."

Uncle John shut off steam, applied the brakes with a jerk, pulled the reverse lever over, and then, seeing nothing dangerous ahead, glared at his fireman and asked, "Where is that red cow?"

"I did not say anything about a red cow," humbly answered Burns; "I said look at that red bird."

"Red bird be blanked!" wrathfully retorted the irate engineer. "Young man, you are new to this job, and I excuse you this time; but if you ever say red bird to me again I shall throw you right off the engine."

Editorial Correspondence.

West Shore Railroad Shops.

MAN PROPOSES.

When the West Shore Railroad was under construction the intention of its promoters was to build everything in first-class shape. Most of American railroads have grown up piecemeal and their shops have been increased in capacity following the business to be done. The permanent structure and the repairing plants have nearly always been deficient in stability and in convenience. This increases the cost of operating and of maintenance. The West Shore was to start out untrammelled by these sources of restraint and expense. The road bed and all its appurtenances were to be as nearly perfect as the best of material and careful workmanship could make them. The repair shops were to be models of convenience and utility. The arrangement of the buildings was carefully studied to combine facilities for present needs with easy extension to provide for future demands. Mr. Howard Fry, who was superintendent of motive power of the road, determined to break away from the beaten track in the designing of the shops. He was familiar with the best American and European practice in the design of shops, and he made up his mind to select the best features of both and combine in them his own ideas. The outcome of this was the shops at Frankfort, N. Y., now in charge of Mr. James M. Boon.

ORIGINAL PLAN.

The shops, like many other things about this road, did not bloom out in fullness of their conception, the financial difficulties of the company having blighted part of them; but sufficient of the original plan was built to give a fair idea of its value. These were intended only for locomotive repairs, and a roundhouse had no part in the plan. A turn table is set about 50 feet from the main tracks, and the original plan appears to have been to group the buildings round this table, all the tracks radiating from it. As built, the machine shop and foundry are on one side of the table, and the boiler shop and blacksmith shop on the other. The arrangement is compact enough, and Mr. Boon says it is convenient; but the turn table is not the sole means of track admittance to the shops. The ground owned by the company, and the yard tracks, provide the means of reaching the shops with cars at both ends. If all supplies and material going to and from the different shops had to pass over the single turn table, the radial plan of shops might not prove entirely convenient.

However much men may differ about the convenience of the plan of the shops, there is likely to be no question as to the convenience of the internal arrangement of the buildings. Some of the shops are diverted from their original purpose, and the equipment of tools came short of many machines intended to be furnished, but those that are in the shops are first class, and they are used to the very best advantage.

THE ERECTING SHOP.

The erecting shop is an oblong building, 323 × 116 feet, divided longitudinally, one-half being devoted to tools and the other half to the erecting of the engines. The erecting part of the shop is traversed by a single overhead crane which lifts the engines and handles all the material. Care is taken to prevent the crane from being used for trifling purposes, and there is sufficient work of a heavy character to keep it busy. Its use saves a great deal of time in the handling of material, some thought being given the accumulation of loads. While I was in the shop I saw it take up in a sling the whole of the tubes that had been taken out of a boiler and carry them away. The crane seemed to be always doing as hard work as any machine in the shop, which is quite different from some overhead cranes of our acquaintance. It is, I suppose, the old story of the driver having a good deal to do with the amount of work got out of the horse.

The tools in the machine shop are grouped to suit the work that has to be done, and good facilities are provided to reduce the handling to a minimum. They have an excellent tool room in a small spur built on the side of the main building. They have a good template system that is well kept up. They have numerous gauges that are constantly used for checking measurements, and there is an air about the place that betokens that the system of standards used is not an empty name.

STAY-BOLTS, RADIAL AND OTHERWISE.

Mr. Fry was one of the first master mechanics to adopt the use of radial stays for boilers, and his example had a very strong influence in promoting this style of boiler construction. As I had heard it repeatedly stated that the use of radial stay bolts had not been considered a success of the West Shore locomotives, I visited these shops interested in finding out the exact facts of the case. I examined the boilers in the shop very carefully and made inquiries of Mr. Boon about his experience with crown stay-bolts. It was entirely satisfactory. Although this road is noted for bad feed water, they have had engines with the same stays that were put in when they were built in 1883 and none of them have broken. The fire-boxes of radial stay boilers are much easier kept clean than those having crown bars, they are just as safe and they give no trouble whatever. The stay-bolts are put in in a highly mechanical manner. The taps that thread the holes were cut from a continuous thread, and the stay-bolt therefore goes into two holes whose threads coincide with each other.

This company has experience similar to that of other roads with the side stay-bolts breaking. To provide against the danger that arises from broken stay-bolts they are using iron with a small hole through it for the rows that are most given to breaking.

LARGE GRATE AREA BOILERS.

A good many of the engines that were designed to burn hard coal had their grates changed to adapt them for the use of soft coal, and they are said to give satisfaction while using the whole of the grate. The unusually large grate area is considered to be an advantage for fuel saving, especially with heavy trains. Some new boilers they are building for soft coal engines have grates ten feet long. The principal difficulty with long grates has been in firing. When attention is bestowed upon locating the fire door at the proper height, there is no difficulty in throwing the coal all over a ten foot grate.

CAST-IRON MOTION.

At one time there was a movement in favor of cast-iron for parts of locomotives that had previously been made of case hardened iron or steel. The West Shore got some engines about that time which had links, guides, etc., specified of cast-iron. The material wore very well, but in the case of links it proved too weak. When a breakage of a link happened it made such a bad smash of other parts that they have entirely abandoned the use of cast iron links. The cast-iron guides are perfectly satisfactory.

BRASS AXLE BOXES.

A departure from cast-iron made here largely is in the matter of driving-axle boxes. The Fry engines, as a rule, had the boxes too small for the size of the axle and the stresses to be resisted. Consequently there was trouble with broken boxes. Cast-steel boxes were tried, but they have not been a success. Brass is now the material in favor, and boxes made from the common mixture stand very well and give general satisfaction.

The channel rods and the solid end connections that this company did so much to bring into fashion, still hold their own. There is no railroad in the country less troubled with broken rods or hot pins. Mr. Boon favors the use of channel section steel for main rods, and he uses a solid bush for the front end of them.

MODEL BOILER SHOP.

They have the finest boiler shop here that I have ever seen belonging to a railroad. The shop is built in the shape of a cross, the main trunk of which is 246 × 74 feet. The arms of the cross are riveting towers. Arrangements were made for two 15-ton traveling cranes traversing the building, and 10-ton overhead cranes were to do the lifting in the towers. When the building was about finished, and part of the finest machinery in the market for boiler making had been put in place, the financial crash came, the machinery was sold, and the shop was converted into a passenger car repair shop. The *de facto* boiler shop occupies part of what was to be exclusively a blacksmith shop. Both are decidedly short of machinery essential for doing the work cheaply.

The foundry, which is a T-shaped building, is held to the purpose for which it was constructed, and it is the finest foundry I have ever seen in railroad shops. The machinery belonging to the original design is however wanting.

A WELL-ARRANGED PLANING MILL.

About a quarter of a mile up the tracks from the machine shops there are now some car shops that did not belong to the original plan, but are nevertheless convenient buildings for a railroad company to possess. The building that would be of most interest to railroad men is the planing mill, and it is well worth a journey to see. The woodworking machines are well selected and are set to permit the material to keep constantly moving onward till finished. The shafting is arranged with one line through the center of the shop, while other lines are set across. The plan is so worked out that the power from the line shafts is transmitted direct to all machines, no belts being worked in angular fashion. I would strongly recommend mechanical officers contemplating the building of a new planing mill to examine this one.

Stratford Not on Avon.

PRETENTIOUS NAMES.

The people who had the privilege of giving names to places in Ontario, appear to have been unusually zealous to stamp European cognomens upon the province. The idea seems to have been to give distinguished names to hamlets that never would attain celebrity for themselves. In my rambles in Ontario, I have found myself in London that had no tower and little else to attract notice; in a Paris that had no Louvre and no sign of art, culture or wickedness; in a Southampton without docks; in a Dublin without a castle, never a jaunting car and scarcely population enough to fill a jail; in a Yarmouth without bloaters; a Durham without a Cathedral, and a Caledonia, without heather but not entirely devoid of whisky. It seemed quite a matter of course to hear Stratford called out by a voice that might have come from a lineal descendant of Bottom, and to find that the town is a perfect antithesis of its namesake. This was, however, no cause of complaint, for I went thither to see machine shops and the place whose principal claim to attention is the presence of railroad repair shops cannot gracefully exalt itself on account of being called by the same name as the birthplace of England's great dramatist.

CONCENTRATION OF REPAIR SHOPS.

The locomotive repair shops for the Western lines of the Grand Trunk Railway are located at Stratford, and the place is eminently well fitted for the purpose, as a number of the lines belonging to the company radiate from this point, which is conveniently situated for all the Western divisions. The company adopted the wise policy of concentrating in one establishment the work that was formerly done at a variety of places, and Stratford was selected as the seat of the shops that are second in importance only to those at Montreal. Mr. J. Davis Barnett is in charge, and he is ably assisted by A. A. Maver, who was formerly assistant mechanical superintendent of the Great Western divisions.

SHOP ARRANGEMENT.

The arrangement of the shops is odd, and I was not impressed with the convenience of the plan. All the shops are in a large, oblong one-story building, with merely divisions betweeen them, and material is passed through on tracks. The building is well lighted, first-class tools are provided in most of the shops and the work is carried on on a systematic manufacturing basis. A novelty about the building is that it is covered with iron shingles, that are kept from premature decay by being painted once a year. There is a transfer table inside the erecting shop. They grudge the room so taken up, but the arrangement is regarded as a necessary evil in a part of the country subject to frequent heavy snowstorms.

The steam making for the establishment is done in batteries of old locomotive boilers placed together and led by pipes to the various shops where Westinghouse engines are employed driving the machinery. This arrangement is considered very satisfactory, excepting the type of boilers, and is particularly well adapted to the long array of shops. The engines are attended to by the man who looks after the shafting, and they need very little care.

TUSCAN RED LOCOMOTIVES.

In the matter of color the locomotives of the Grand Trunk are novelties, but in other respects the ordinary engine belonging to the road is very little different from those found on railroads in the United States. The standard color of the passenger cars belonging to the company is tuscan red, and the same hue has been adopted for locomotives, all the outside of the engine and tender being made of that color. It has rather a striking effect to see a whole train including the engine painted tuscan red.

TROUBLESOME LIME IN FEED WATER.

Like many other roads west of the lakes, the Grand Trunk has no end of boiler trouble caused by lime salts in the feed water. The company have tried numerous water purifiers, mechanical and chemical, but they have now settled down to depend upon the wash-out hose and the boiler-maker. The demand for repairs to the boiler generally brings an engine into the shop. They repair at Stratford about 20 engines a month, and put in from three to four new fireboxes. The tubes run only about 50,000 miles before they have to be cleaned, and a firebox stands about 200,000 miles of service. They use Scotch steel exclusively for boilers and fireboxes, and it lasts fairly well, but the foreman boiler-maker admitted that American steel flanged better. The Grand Trunk went very extensively into the use of radial stay bolts for sustaining the firebox crown, but they are now going back to the use of crown bars. The objection to radial stays is that their use distorts and cracks the back flue sheet. The boilers are all straight, and baffle plates on the firebox door and brick arch in the firebox are used on all engines. The boiler and its appurtenances receive unusually vigilant attention from the mechanical officers of the Grand Trunk.

LOCOMOTIVE RUNNING GEAR.

Many of the locomotives still in use have slab frames, but the advantage gained is not considered material, for the later engines built have all bar frames. The combination of bar and slab frame is, like nearly all combinations, a failure. A great many of the engines have a plain slab, rather light side rod, which is very well spoken of for durability and lightness on repairs. They have also some I-channel side rods that are popular. A fairly light rod of this pattern displayed extraordinary strength in a case they had of a badly bent driving axle. The rod buckled considerably, and the strain must have been terrific, but it did not break. They are putting Mansell retaining rings on all their driving wheels as fast as the engines come into the shop. The work involved is very great as the seats for the rings have to be turned out on both sides of the wheels and then the retaining bolt holes drilled. Hardened steel templates are employed in drilling the holes, so that the rings of all wheels of the same size are interchangeable. Mr. Barnett is a warm believer in the safety secured by the Mansell ring. His faith in the device is not shared universally, especially in the United States. They use cylinders separate from the saddle, even for the largest form of engines, and no difficulty is experienced from the cylinders getting loose on their fastenings, but they are particularly well secured both to saddle and frames. Brass axle boxes are largely used of the common six to one mixture, and there is no difficulty with their breaking or wearing out rapidly. The sides are not fitted close to the journal.

A HAPPY SHOP FAMILY.

A good reading-room and library are maintained by the company for the use of the employés, and they are said to be very well patronized. The workmen of Canadian rail-

road shops do not appear to be so migratory in their habits as those in the United States, which may in a great measure be due to the fact that stock gambling does not affect their earnings. The company reaps the benefit by the retention of first-class workmen, a condition of affairs particularly pleasant for the officers in charge. There may be unseen drawbacks about the Stratford establishment, but from what I could note on the surface I concluded that Mr. Barnett was exceptionally pleasantly situated in the character of the foreman and workmen who are under his charge.

Michigan Central Car Shops.

ARRANGEMENT OF SHOPS.

Four or five miles west of their passenger depot at Detroit, the Michigan Central a few years ago built on a fine open plot of ground extensive car shops on a scale calculated to meet the requirements of business for 20 years. Very much short of that period has elapsed since the shops were built, but they are already away behind the requirements of the company, and important additions are now contemplated. The shops were built on an unusually comprehensive plan, and were intended for the manufacture of cars and all their parts under the conditions most favorable for doing the work cheaply and well. The buildings are all substantial brick structures, finely lighted, well heated and ventilated, and provided with first-class machinery. The principal buildings stand in a line, and the material moves from one end in the rough and terminates in the paint shop. The blacksmith shop, foundry and planing mill, all unusually well-equipped shops, originate their several products, and send them along by a good system of transportation to the machine shop, the erecting shop and finally the paint shop. The able personality of Mr. Robert Miller is apparent in the shop arrangements, and he has evidently found a worthy successor in Mr. E. D. Bronner, who is now general master car builder of the road.

Cars are put in and taken out of the erecting shop and paint shop by tracks that curve from a leading track and run directly into the building. A transfer table was used originally, but having room to run in the tracks direct, they filled up the transfer pit, and find the new plan very much more convenient. A 26-stall roundhouse is used for freight-car repair work, and it is considered as convenient as any style of house for this purpose. There is not much repair work done outside, and the men doing the work are very thankful, and their doctor's bills are reported to be unusually light for that class of workmen.

WORK GOING ON.

There are at present about 350 men employed in the shops, mostly on repairs, but they are building one freight car a day and one passenger car a month. The system of repairing is thorough, and the whole of the cars are kept in unusually good order, not only in outward appearance, but in every detail that adds safety and durability to rolling stock. It is very seldom that the breakage of anything about a Michigan Central car leads to a wreck, and the saving that results is the return that pays directly for keeping the cars in good order.

They are taking all the cast-iron wheels from under baggage, express and second-class passenger cars, which are the only part of the passenger equipment having these kind of wheels, and replacing them with 36-inch steel-tired wheels. They are putting 42-inch wheels under all new passenger cars, and all passenger cars have been lately equipped with the quick-acting air brake and air signal. They have lately changed the outside of the cars from yellow to the Pullman color.

Improvements in freight equipment are represented by the putting of the air brake and Janney couplers on all cars that are 34 feet long or over. They are pushing this work as rapidly as the force employed will admit of. All their new cars have a particularly substantial iron truck with a swing-beam center, a style of truck which has given entire satisfaction on this road. Steel brake-beams are also applied to all the new car equipments.

FACILITIES FOR DOING WORK ON A COMPETITIVE BASIS.

These works are unusually well prepared to do new car building to advantage, for they carry as large a stock of lumber in their ample yards as will be found in the yards of most contract shops. Their planing mill is filled with the best of modern wood-working machines, and the place is sufficiently large so that the machinery is set along the sides, and space is left in the middle for a car track, which greatly facilitates the movement and prevents crowding.

The iron machine shop is badly crowded, and they expect to build a new one soon. The foreman of this shop takes great pride in trying the capacity of the different tools. He gets eight or nine axles a day turned in the ordinary axle lathes, and a Niles wheel lathe, in which he takes a great deal of pride, turns four pairs of steel car wheels a day. The advantage of using first-class tools may be inferred from the fact than an old lathe in the shop, which is considered a good tool of its kind, turns a pair of wheels in seven hours. A. S.

In the shops of the Grand Trunk at Stratford they have devised and put in use a very simple device to prevent wheel lathes from chattering. A strong clamp is bolted to the lathe frame, with one end formed into a guide, which is pressed slightly upon the outside edge of the faceplate. This small kink has enabled them to materially increase the work done on some of the weaker lathes.

Objectionable Practices.

In the course of a private letter to the editor of this paper, Mr. P. Leeds, Louisville & Nashville, says:

In looking over the April number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, I have noticed several places where you have taken points that had been pretty well stirred up at the Southwestern Club. Among the other things that caught my eye was the letter signed Justice, in which he takes you to task for intimating that some master car builders were using cast-iron knuckles for repairs; also your editorial on the same, in which you say you are not prepared to back down from the position you took in the matter. I say to you, you have no occasion to back down.

CAST-IRON KNUCKLES.

In one of our meetings (I do not know whether at Nashville or Chattanooga), I called on the club to express their disapprobation of such miscreants as would use cast-iron couplers whereby they endanger railroad property and lives even more than any one would by using a cast-iron link, as the knuckle might pass inspection and only fail on the road, causing a break into and smash up, while a cast-iron link would not go very far before revealing itself. After some desultory talk, the opinion was expressed that it was not a matter that the club could take up officially and discuss, as, in fact, there was no discussion to it; at the same time my recollection is that it was voted that the club censure any one guilty of such practice.

At that time I cited a case where one of our master mechanicsc alled my attention to some broken cast-iron couplers, and stated that they came out of cars that had been rejected at one of our interchange points on account of defective knuckles, and after a short delay they presented themselves with knuckles properly applied. I made it my business to stroll into a merchant foundry where the road presenting these cars to us had their castings made, and saw with my own eyes two patterns for different makes of couplers. I at once gave the master mechanic instructions to get me two castings from each of these patterns. The next day he made inquiries, and, by means of sketches, he made the foundry men understand what he wanted, and they said: "O, yes, those patterns belong to so and so, and we have to send them home every time we make a half dozen castings." He then told him the first time those patterns came to the foundry to make him the castings I had ordered. Some two weeks after he notified me that he had received the castings, and we have them in our possession. I then had him to notify the parties that this practice had to be stopped.

I do not know that I should hold one of my car inspectors responsible for putting in a cast-iron knuckle, for the fact that he thought all knuckles were made of cast-iron, but I most assuredly should want to know where he got the pattern to make one from, as I cannot conceive how so expensive a pattern, as the making of these knuckles necessitates, could be authorized by the average car inspector.

WEAK TRUCKS.

I would call your attention to something that is an enormous expense to the main lines of the South, and which I think Master Car Builders should take up and make an arbitrary ruling on; that is, the dimensions of arch bars, column bolts, truck bolsters, etc., that should not be allowed to pass under a car whose body is marked any particular capacity; for instance, there are some of the little old narrow gauge roads that have been widened, and absorbed by other lines, who also changed the gauge of their cars by putting in bolsters and axles to the proper dimensions. To this I take no exceptions, but when such cars are marked 40,000 and 50,000 pounds capacity on a truck with five feet spread of wheels, and arch bars of it are only $\frac{7}{8}$ by 3 tied together by $\frac{7}{8}$ column bolts, the columns being only about 15 inches long, I protest that there ought to be some rule establishing the size of arch bars, the size and length of column bolts. In fact, I consider it just as essential as giving the dimensions of axles for different capacities of cars, and more so, as, on this system, we have hundreds of broken column bolts and arch bars to one broken axle, and I believe I can safely say, many more serious wrecks.

BURNING OF CARS IN SIDINGS.

Another thing that I think ought to be taken up is Rule 28. I do not believe that any railroad company can, in equity, be held responsible for the destruction of a car by fire on a siding, and I think this rule should read so as to make the parties responsible who are responsible for the position of the car at the time any damage is done to it, the responsible parties, no matter whether it is a private siding or whether they are handling it under a switching charge, or what the conditions are, as it is obvious that if this siding could be reached by the company who originally handled the car without the intervention of this transfer company or party doing it under a switching charge, they would not have turned it over to them for handling, and undoubtedly nine cases out of ten, if it were not that this belt line or section of track did reach the siding, and, therefore, removing the necessity of the company originally owning the car reaching it, they would have had a side track there themselves, and we would have been under no obligations to pay any one else for this service, and as the rates charged by transfer companies and by companies handling freight on switching charges is always extremely heavy for the service rendered, I think they should be considered on the same basis as a regular railroad company, as, in point of fact, they often get more revenue from a car on a switching charge than the company delivering it to them. Besides this, many times such cars are held an unreasonable length of time, and if handled by the original company would not have been at the point they are destroyed in case of fire, but in case of fire or accident, not incident to railroading, or the handling of cars as a railroad company, such as cases of fire, I think the owners of the cars should be responsible for their equipment wherever they are, and that they should not ask other companies to act as insurance agents for them unless they can show negligence on the part of the company to handle them under the best usages of railroading.

Care of Freight Train Air Brakes.

Mr. James Meehan, of the Cincinnati, New Orleans and Texas, writing about the necessity for systematic inspection of air brakes on freight cars, says: Our general manager has ordered all cars which are equipped with air brakes to be switched to the front of the train, and has advised us to equip our freight engines as early as possible with air brakes. This we have been doing for some time past, and will very soon have all our equipment, freight, passenger and switch engines equipped with air brakes. Our object in equipping switch engines as well as road engines with air, is for the very purpose suggested in your letter, of testing the air on cars received from our neighboring roads. This we deem of as much importance as the examination of other defects, as we require a card from the road delivering cars with air brakes in bad condition, the same as cars with other defects. It is a very difficult matter to handle, however, unless some standard rules are adopted by the master car builders. My suggestion would be for all roads to equip their switch engines with air, and in delivering cars of freight to their neighboring roads, to be compelled to switch their air brake cars together, test them with their switch engines and then card them for defects found on the air brake apparatus, the same as for other defects found on the car. When the cut is delivered to the receiving road, they in turn back their switch engine up to the cut, testing the air brakes again and checking their neighbors. There can be but little doubt but this method would be far superior to putting facilities in the yard from a stationary engine, or have a stationary engine for this purpose placed at interchange points for pumping air to make the necessary tests. We have several interchange points along our system where it would be thoroughly impracticable for us to put in such an arrangement.

Making Hard Times.

Money is difficult to collect these days, and there is much croaking about hard times, although business is really good and the future prospects unusually promising. That is a summary of a review of the business situation made recently by President Ingalls, of the "Big Four," who said that the current talk reminded him of a little story about a friend of his. This man, who is a manufacturer in New England, was some years ago on a visit to Boston. When he went to his hotel at night he felt disturbed by the noise, and, not being able to sleep, he got up and began reading a newspaper which he found in his room. It was full of complaints about the depression of business and of dolorous anticipations of an approaching season of general depression. The manufacturer became panic-stricken. He had not before realized how precarious was the business situation, and he became impressed with the necessity for radical retrenchment in his expenses. He hurried home, and, although there was no scarcity of orders, he ordered a reduction of the working force and lessened the working hours. A day or two afterward, when the news of the reduction of time and force in the manufacturer's works got bruited about, his friends began to drop in and protest against the movement, calling it unnecessary and not consistent with the condition of trade. "But," said he to one friend who was particularly persistent, "the papers are full of the depression of business and of the bad lookout for the coming season."

"Where have you seen any news of that character?" asked the friend, and the newspaper was brought out. It was found to be three years old.

The New York, Susquehanna & Western have ordered four cars to be equipped with the Martin system of steam heating and the gas lighting system controlled by the Martin Company.

David Phillips reports to the British Institute of Marine Engineers that he had made experiments extending over seven years—from 1881 to 1888—with two pieces of Bessemer steel boiler plates, two of Yorkshire iron and two of B. B. Staffordshire iron. All the plates were the same size, and all were kept immersed in salt water. During the first three years the plates were in contact, and the steel plates lost 120 per cent. more than the iron; during the second three years the plates were separated, and the steel lost 124 per cent. more than the iron. For the entire period of seven years the loss of the steel was 126 per cent. more than that of the iron plates.

Model Locomotive Repair Shops.

The plan of the railroad repair shops illustrated in the annexed engraving was worked out by the mechanical officers of an important railroad that has the building of new shops in view. The shops are intended for doing the work of keeping 500 locomotives in order, and for performing manufacturing operations for the engineering department. The shops were designed after exhaustive study, aided by the examination of plans of the most successful shops in the country. If any of our readers can suggest any improvements to the plan they will be gladly received by the designers.

The main erecting shop is to be one story high, monitor roof, 115 feet wide and 517 feet long. It is to have 25 pits, 22 for general repairs, and three longer pits to contain an engine and tender for short jobs; and one of these pits arranged so as to lower a pair of driving wheels. The erecting side of the shop is to have a 50-foot beam, overhead travelling crane which will run the whole length of the shop, and is to be capable of hoisting the heaviest engine from off its wheels. Back of the pits there is 25 feet for spare floor, with a track in the centre and three small turntables opposite the centre of the wood shop, machine shop and blacksmith shop.

On the other side of the shop will be located the heaviest tools for wheel and axle work. A 100 horse power engine will run this room.

The wood shop will be 150 feet long by 80 feet wide, two stories high, and have a monitor roof. All of the tools will be on the lower floor; the upper floor to be used for the storage of dry lumber, cabs, pilots, etc., which are to be kept on hand. A 50 horse power engine will run this room.

The machine shop will be 150 feet long by 80 feet wide, two stories high, with a monitor roof. All the tools will be on the lower floor. A part of the upper floor will be used for the storage of all parts of the running gear of an engine which have to be kept on hand. The copper and tinsmith shop will occupy the rest of the upper floor. This building will also have a 100 horse power engine.

At the end of the machine shop is a small building for pickling, rattling and snagging castings.

The blacksmith shop will be 150 feet long by 80 feet wide; one story high, with a monitor roof, and have no columns in the center of the shop. It will have an exhaust fan for carrying away the smoke, instead of chimneys. A 50 horse power engine will run this room.

The boiler shop will be 150 feet long by 80 feet wide, one story high, with a monitor roof; no columns. In a shed at the end of this shop there will be a rattler for cleaning flues. On one side of the boiler shop will be another shed for the storage of boiler plate and tender castings.

The tender shop, which joins the side of the boiler shop, will be 141 feet long by 65 feet wide, one story high, with monitor roof. Over each track in this shop will be an overhead railway for hoisting tanks. The tender work should be near the boiler shop, as the back ends of the tanks we all know get frequently dented. In the end of the tender shop next to the boiler shop will be located a 50 horse power engine to furnish power for both shops.

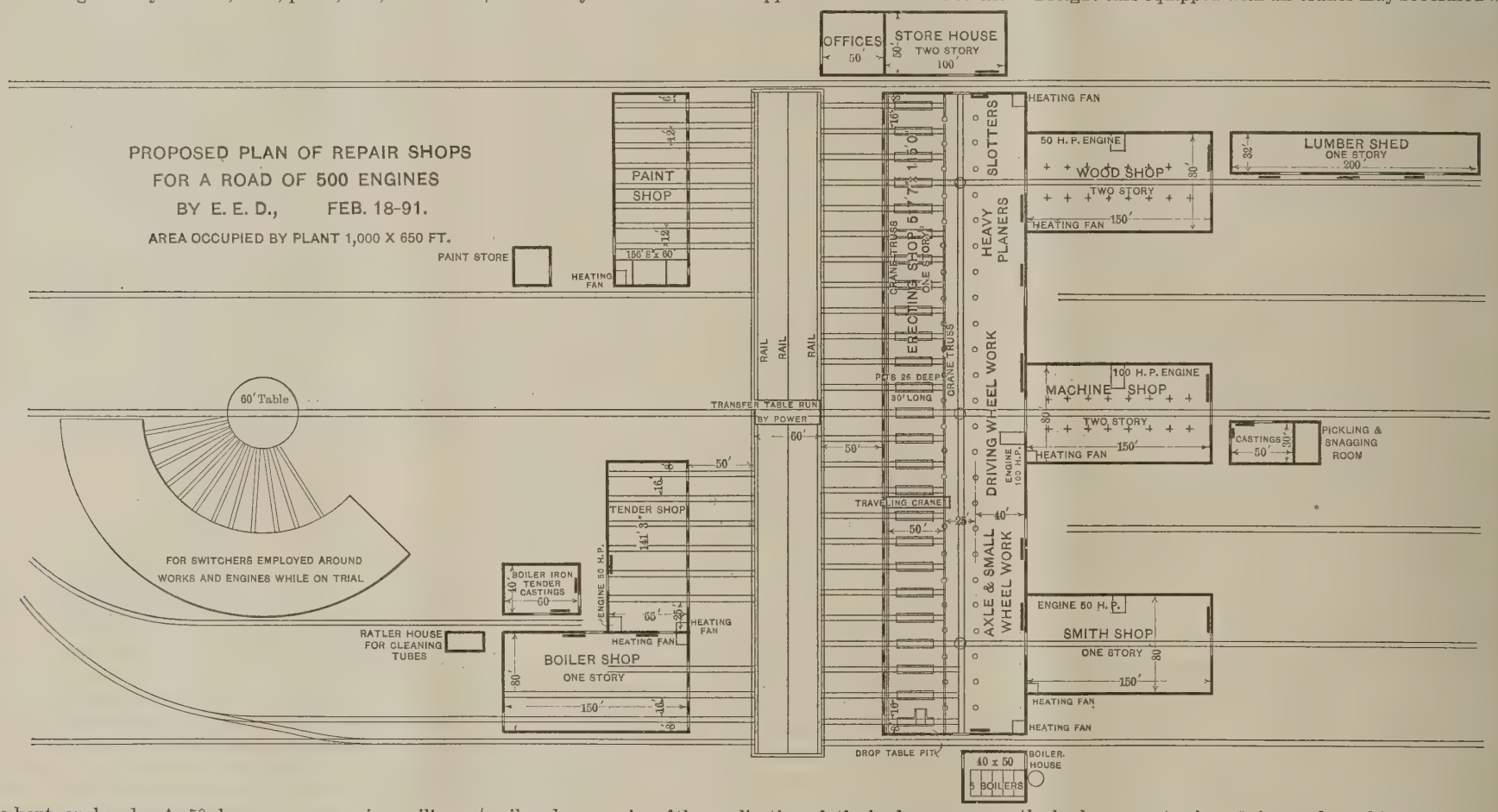
The paint shop is to be 158 feet long by 60 feet wide, one story high, with a skylight roof. It will be capable of holding 16 tanks at a time. One end will be fitted up for painters' supplies, heating, etc. About 50 feet back of the paint shop will be a storehouse 30 feet square, with a cellar underneath for oils, paints and varnish.

At the side of the main shop will be a transfer table 60 feet wide with power attached for moving all dead engines in either direction.

There will be a roundhouse of 10 or 12 stalls with a 60 foot turntable for the engines around the shop yard and the engines in and out for repairs. Two or three stalls can be used for spare tenders, etc.

Each shop will have a blower. They are used for heating in the winter and ventilating in the summer. Each room will be run independently by its own engine, and the steam for the whole plant taken from one main boiler room. It will have five boilers whose steam pressure will be 150 pounds to the square inch.

The office and storehouse will be 150 feet long by 50 feet wide and two stories high. In one end of the building will be the offices and drafting room.



Inspection and Repair of Freight-Car Air Brakes.

At the April meeting of the Central Railroad Club a committee consisting of E. D. Bronner, A. M. Waite and J. R. Petrie submitted a report which was prepared for the purpose of making recommendations to the Master Car Builders' Association respecting changes that ought to be made in the Rules of Interchange of Cars concerning the inspection and repair of air brakes on freight cars. The report says:

When it is considered that at the present time there are about 160,000 freight cars equipped with the automatic air brakes, which is over 16 per cent. of the total equipment of the country, and that they are being applied at the rate of over 50,000 cars per year, the great and growing importance of the subject in hand will be appreciated. The cost to the railroad companies of the application of the brakes now on, over the cost of the ordinary single hand brakes, has been about $80 per car, or a total expenditure of $12,800,000.

To realize on this investment and to derive the full benefits of the possibilities of the brakes is a question that requires immediate and widespread agitation. The necessity of care and attention for passenger-brake apparatus seems to be fully realized, but from the information at the command of your committee the only conclusion to be reached is that air brake apparatus on freight cars is generally neglected, resulting in a low average condition of the brakes, and showing that fully 25 per cent. of the cars now interchanged are disabled or at least not in the highest condition of effectiveness as far as the brakes are concerned. The causes which detract from or neutralize the effectiveness of the brakes are many, and among the most glaring are slack in connections, foul, gummy triples and cylinders, leaks of various kinds, and a lack of oiling. Some of these defects are easily and quickly repaired or remedied, such as taking up slack, cleaning and oiling triples or cylinders and repairing leaks in some cases. This work could be done at a cost as follows:

Cleaning and oiling triple valve; cleaning and oiling cylinder; taking up slack in connections; putting new rubber seat on emergency valve when necessary (when leather seat is found it must be replaced by rubber seat in all cases), 50 cents.

Repairing leak in main pipe, when section of pipe must be removed, 25 cents.

Repairing triple valve gasket, 30 cents.

In order to obtain the use of brake apparatus on cars being interchanged, it would be necessary under the existing condition of the freight brakes of the country to repair many foreign cars, with the defects above enumerated. The question arises as to who should be responsible for the cost of the work. It is evident that in this progressive period of railroad affairs the air brake apparatus on freight cars is coming to be considered as vital and important a part of a freight car as a door or a roof. They might run without either, but they were applied for a purpose and should be in a condition to fulfill that purpose. This being admitted, it follows as a natural consequence that the owner of the car should be responsible for its condition, when found ineffective, due to natural wear and tear, the same as it were for a worn-out wheel. It appears to your committee that the most effective method of improving the freight brakes of the country, and enabling users to obtain the benefits, would be to inaugurate a more rigid system of inspection, and to fix a standard for interchange. This should be incorporated in the M. C. B. rules of interchange. It should be demanded that brakes on freight cars offered for interchange be in good working order, and that, when found in ineffective condition from causes which are inherent or for which the owner is responsible, it may be permissible for the company in whose possession the car is to make necessary repairs and charge the cost to the owner. In order to bring the matter up for discussion, your committee will attempt to formulate a rule or set of rules to govern the interchange of freight air brakes, and, after discussion, criticism and revision by the assembled wit and wisdom of our club would recommend that they be brought to the attention of the Executive Committee of the Association for discussion before the National Convention. The object will be to improve the general condition of the freight brakes and give the user an opportunity to make necessary repairs and to make a fixed charge for doing the work, which shall be large enough to cover the expense, but not large enough to develop a new branch of railroad revenue.

RULES.

I.

Freight cars equipped with air brakes may be refused when the brake apparatus is not in good working order. To be considered in good working order the following conditions must be fulfilled:

(a) Cylinders and triples must have been cleaned and oiled within six months.

(b) Cylinders must have been oiled within three months.

(c) Pistons must be adjusted so they will move not less than four nor more than nine inches.

(d) Triple valves and auxiliary reservoirs must be free from water.

(e) Air hose must be coupled with another car, or coupled properly in the coupling hook.

(f) Brakes must apply and release instantly upon the proper movement of the engineer's brake valve.

(g) Pipe, connections and all attachments must be absolutely free from leaks.

(h) Dates showing when cylinders and triples were last cleaned, oiled and tested must be marked plainly on cylinders.

(i) Brakeshoes must be of sufficient thickness to run the length of the road without changing.

(j) All parts of brake rigging must be sound and in accordance with Rule No. 3, Section s, of M. C. B. Code.

II.

When found on foreign roads in condition not fulfilling requirements in Rule I the following named defects may repaired or remedied, and bill rendered against the owner: Cleaning and oiling triple valve; cleaning and oiling cylinder; taking up slack in connections; putting new rubber seat on emergency valve when necessary; repairing leaks in pipe; replacing triple-valve gasket. When defects exist that are greater than above mentioned, or which would not be covered by the prices allowed, the air should be cut out and the owner notified.

A variety of other rules were given relating to the prices to be paid for the repair of air brakes and the way in which the work should be done.

Sinclair's Paper on Care of Air Brakes.

At the last meeting of the New England Railroad Club President Twombly announced that the subject for consideration was "Air Brakes for Freight Trains: Their Care, Condition and Efficiency." The following paper on the subject by Angus Sinclair was read:

Additions to train mechanism have been introduced so rapidly of late years that the facilities for keeping them in proper order have been habitually behind the requirements. With all our boasted enterprise and progressive spirit, railroad men are peculiarly conservative, and there is a strong tendency to insist that the existing personnel and plant are sufficient to care for new appliances whose maintenance naturally calls for special skill and training. This has been strikingly exemplified in the crude y that brakes and heating apparatus for passenger trains have been handled and looked after on not a few railroads; but we need to look closely into the condition of the air brakes on many freight cars to properly realize the effect of permitting them to run without special attention.

RAPID APPLICATION OF AIR BRAKES TO FREIGHT CARS.

There are already in use on the various railroads in the United States upwards of 160,000 air brakes applied to freight cars. This represents an immense amount of capital expended for the purpose of facilitating the movement of trains, and to increase the safety of train operating. In order that the benefits may be reaped which will bring an equivalent for this vast expenditure of money, it is necessary that the brakes should be maintained in good working order, and this can be done only by the hearty co-operation of all the companies over whose lines freight cars travel. If freight cars equipped with air brakes never went away from the lines they belonged to, the question of maintaining the brakes in proper order would be easily settled; but the cars have to go wherever a track extends, and it is time provisions were made for air brakes receiving as much care and attention on foreign lines as they receive at home. Voluntary enterprise has already applied air brakes to a considerable percentage of all the freight cars running, and public sentiment is urging onward the work of equipping the remainder; so it is a question of a few years only when a freight car without a power brake will be as great a rarity as it is to-day to see a passenger car controlled by the hand-brake.

AIR BRAKES OUGHT TO BE RECOGNIZED IN THE INTERCHANGE RULES.

It is well to look facts in the face. As the general application of air brakes to all kinds of cars is inevitable, it becomes the duty of the officers in charge of railroad rolling stock to lose no time in beginning to prepare for the change. The preliminary movement ought to be, to make public recognition of the air brake in the rules of interchange of cars, and to establish regulations about its condition. Under the existing rules, a car may be refused for certain defects of the hand brake, because a car that has not an efficient hand brake is not safe to be run on a train. Under the conditions of freight train service that are rapidly approaching, a car with an air brake out of order will be a source of danger.

URGENT NEED OF INSPECTING AND TESTING APPLIANCES.

A good many of the railroad companies operating freight cars equipped with air brakes have provided appliances and men for testing the brakes and maintaining them in good order, but others have practically ignored the brake. It is edifying to watch the condition of the air brakes on cars arriving by different roads into large junction yards. Those on some roads have the slack properly adjusted, the hose fastened in the dummy couplers, and a general air that the brake is there for a good purpose. On another road we find the air brakes habitually in disorder. The piston has reached the limit of its travel, the triple valve is out of order, and the hose is dangling loose, lapping up its fill of dirt and grit from the road-bed that will work mischief in the triple valve and cylinder for many a day after the car goes into better hands. The curious feature of the case is that the company taking good care of the brakes generally appears to perform the work of inspection at smaller cost than the company that neglects the work.

Neglect of air brakes comes to a great extent from lack of system. The companies that take good care of all air brakes passing over their roads, are not asking for anything unreasonable, when they demand that all connecting companies should provide the means of systematically testing air brakes and of keeping them in working order. An objection strongly urged against the change suggested is, that being required to examine and repair brakes belonging to other companies would work an injustice upon roads that did not have any of these brakes upon their own cars. It might be said on the other hand that the railroad companies which fail to adopt a recognized improvement, like air brakes, are inflicting injustice upon every enterprising road over which they send their cars. The purpose of the rules of interchange of cars is to do justice between the roads doing business with each other; but safety in the movement of the cars is held of paramount importance. Connecting roads will not accept a car with an axle that is dangerously small, or with any other defect that is likely to cause an accident: and the excuse is not regarded as valid that the owners of the car are accustomed to use on their own road small axles or other attachments not considered safe. The rules that regulate this matter are no doubt considered unfair by those they put to inconvenience, and it is doubtful if they would find the keeping in order of air brakes belonging to the cars of other companies a greater hardship.

HOW THE MEN MOST INTERESTED REGARD THE AIR BRAKE PROBLEM.

Within the last month I have been in communication with nearly all the heads of the car departments of railroads running more than 1,000 freight cars, and the admission generally made upon the air brake question is, that something must be done in the near future to inspect air brakes at all interchange points. Some of the writers anticipate no difficulty in doing the work, others appear to think it one of the most stupendous problems that ever railroad officers have had to work out. Those who are appalled by the magnitude of the work to be done may receive comfort from reading how others have done it. Mr. J. Small, superintendent of motive power of the Southern Pacific Company, writes: "We are one of the few systems, the entire rolling stock of which is equipped with air brakes, and having mountain grades on all three of our main lines, we are naturally obliged to give the care of air brakes especial attention. At all division terminals we have air plants for testing air brakes on freight and passenger cars; these, however, are intended more for the use of car repairers, and are usually located at the repair shops, and when repairs to cars are completed air is applied at standard pressure, and cars are turned out from the repair tracks with air brakes in first-class condition. I think it is important that air plants of this kind should be located at all important interchange points, as well as stations where other car repair shops are situated. Our switch engines are all equipped with air brakes; and, at interchange points, before cars are received from the connecting line, the inspectors have air applied to them by the switch engine, and they are thus enabled to determine at once, and before the car is received, whether there are any defects in the air brakes. Therefore, where switch engines are equipped with air brakes, it would seem to be unnecessary to have an air plant as above described at interchange points, where there are no car repair shops and simply ordinary running repairs are made. I inclose a copy of our book of rules governing use and care of air brakes; also inclose a card on which conductors are required to report any defects they observe in the air brakes during their run. This card is handed to the inspector immediately upon arrival at terminal station. This is intended to enable the car inspector to give immediate attention to such cars as are reported on this card and save the time that would be otherwise lost in hunting for or perhaps overlooking them. I am not prepared just now to offer any suggestion as regards interchange rules for inspection of air brakes, but think that one rule would, perhaps, be sufficient—that is, air brakes would not be received except in first-class order."

The book of rules referred to contains instructions about the handling and care of the air brake, which all men concerned in the care or management of the brake ought to be familiar with. The card mentioned is for the conductors reporting defects of the brakes on cars that may be on his train. The letter, book and card indicate that the air brakes on cars belonging to the Southern Pacific are systematically cared for. It contrasts strikingly with the hap-hazard methods in vogue elsewhere, which lead to general neglect.

There is a mistaken impression in some quarters about the class of workmen necessary to keep the brakes in order. An ordinary car inspector will be told to put in order a defective brake, and because he fails, the conclusion is jumped at that the services of a machinist are necessary to do the work. It is not skill, but knowledge, that the inspector or car repairer lacks. If he were drilled for a day or two in taking the mechanism of a brake apart and putting it together again he could do the work just as well as a machinist. The work cannot be learned by inspiration, and it is the duty of the officers in charge to see that the men under them receive the opportunity to learn how to put the brakes in order.

Judging from the numerous letters which I have received on the subject of "Air Brakes on Freight Cars," from the men best able to speak with authority, I conclude that the pressing requirements are:

1. The recognition in the Rules of Interchange of Cars, that air brakes are an essential part of a car and that they must be delivered in working order.

2. That it is the duty of railroad companies to provide the means of testing and repairing the air brakes on all freight cars that pass over their lines.

Mr. Marden said he believed that air brakes on freight cars to day were not given the care they should have, even on the roads that owned the cars. If the air brake were in proper condition when the car started, it would run almost any number of miles without getting out of order.

Mr. Lauder said that air brakes on freight cars had come to stay. The universal application of them to freight cars would do more to obviate the dangers to trainmen than all the other improvements combined. He believed with Mr. Sinclair in the establishing at junction, or inspection points, of an air plant for thoroughly testing the brakes on the cars, as with the appliances in present use it was impossible to tell whether the air brake was in order or not. The only way to determine was to apply air to the brake and see how it worked. He thought such a plant could be established at little expense, as gas pipe of the requisite size costs but little, and the labor and expense of putting in a boiler or a compressor of some kind was a comparatively small matter, and by stringing the pipe through the yard it could be made available where trains were made up at no great cost.

Mr. Kolseth said that 90 per cent. of the railroads in the country carried 70 pounds pressure, a few roads in the neighborhood 60 pounds. He was in favor of making the pressure uniform and of giving the air brake inspector the authority over all parts of the brake equipment on cars and locomotives.

Mr. Lauder said the number of steam plants required at terminals for heating passenger cars by steam would work nicely with the air brake testing appliances, as the air plant could be incorporated with it at little cost, and the brakes could be properly tested at such points.

Mr. Soule believed that inspection was too often considered as embracing both inspection and maintenance. If a car be run from Chicago to Boston, he said, with the brakes in defective condition, it would not follow that they had not received proper inspection, as under the rules of interchange, cars could not be rejected for defective air brakes. In the interchange of freight cars, the only thing considered in the inspection of air brakes at present is their condition as affecting the use of the hand brake; the safety of the car is of absolutely no account. Many air brakes had been and would continue to be run in bad order, until a rule should be adopted requiring them to be delivered in good order, but he thought this condition of things might be greatly improved were roads to attend to the repairs of air brakes when the cars were empty. The air brakes would be kept in much better condition if a road, failing to provide the appliances for repairing air brakes, and not maintaining them on its own cars, were to be willing to pay for such maintenance when performed by some other road, or when by reason of absence from the owner's road they become inoperative from ordinary wear and tear.

Mr. Adams said the expense of applying air brakes would be about double that of the vertical hook couplers, but he believed they ought to be used. By the arrangement suggested by Mr. Lauder of laying pipes through the yard, the brake could be tested in the train as it stood, without removing the car. This arrangement would do away with the switching engine for testing. He thought some kind of an automatic arrangement would be necessary for taking up the slack of brakes.

Mr. Marden thought trainmen should be instructed in the construction and use of the air brake, and an instruction car, subject to the different roads, would be good to show the action of brakes of different kinds and their appliances.

Mr. Lauder said, as the use of freight brakes increased, it would necessitate instruction as to their use and maintenance, and as regarded instruction cars, he believed the Westinghouse Company would furnish a good many appliances for such cars free of charge, in order to have them properly equipped.

Mr. Adams said if each road could not have an instruction car, he moved that the New England Railroad Club recommend to the railroads concentrating in Boston that they purchase or build a car and equip it properly, for the instruction of the trainmen in the use and operation of air brakes, said car to be in charge of a superintendent furnished by the roads, the expense to be divided *per rata* among the roads. The motion was carried.

Valuable Train Cards.

The freight train conductors on the Southern Pacific carry a card on one side of which a form is prepared for reporting particulars of trains breaking in two. What broke, and how it broke has to be reported, also whether it broke in starting, running or stopping, and what repairs had to be made by train-men. If these forms were in general use, superintendents would be able to tell with more certainty the cause of accidents and the necessary remedies could be applied.

On the other side of the card defects of automatic air brakes are reported. If a car has to be cut out through defects of air brake this is noted and any details of the defects known to the conductor are noted down. This card is handed to the card inspector when an inspection point is reached.

Michigan Central Passenger Cars.

Several very handsome new passenger cars have lately been built in the car shops of the Michigan Central Railroad at Detroit. They are arranged inside with a smoking room and gentlemen's toilet at one end and a ladies' toilet at the other end. They are finished in mahogany after a very tasteful design. The framing of the cars is particularly worthy of the attention of the master car builders who are anxious to build a strong passenger car. The ends are strengthened by iron plates after the plan illustrated in pages 91, 92 and 109 of the NATIONAL CAR AND LOCOMOTIVE BUILDER of last year. The end sills of the car bottom are formed of two parts with a $\frac{3}{4} \times 8$ inch iron plate placed between them, the whole being securely bolted together, and to heavy iron angle plates at the corners where the sills are framed to the end sills. The longitudinal sills are all framed into the inner piece, thus leaving the main sill intact to better resist all strains. President Ledyard's private car, which received the blow of the locomotive in the Palatine Bridge collision and came out with little damage although cars ahead collapsed, was framed with this style of strengthening. The cars have three double-burner lamps in the body and one in the smoking room. They are carried on trucks having 42 inch Krupp wheels and journals $4\frac{1}{2} \times 8$ inches. They are equipped with the quick-acting air brake, steel brake shoes, the air signal and the Martin car-heating appliances.

A report prepared by the Census Bureau on the cost of operating street railways says the expense per car mile on cable roads varies from 9.39 cents to 21.91 cents; on electric roads from 8.34 cents to 36.04 cents; on animal roads from 9.10 cents to 27.02 cents.

After a series of exhaustive tests the United States Naval Department has consented to authorize the use of steel made by the Clapp-Griffiths process for naval construction work. This steel is made by a special process which is not unlike the Bessemer converter method, but the product is reported to be of as good a quality as steel produced in the open hearth. Molten iron drawn from cupolas is poured into a peculiar form of receiver provided with air passages. Hot air is then blown upward through the mass of iron and the impurities are burned out. This process promises to cheapen steel that will be suitable for various purposes in connection with railroad rolling stock.

Pennsylvania Railroad Passenger Car.

The car shown in the annexed engravings and in the supplement page is the standard passenger car of the Pennsylvania Railroad. It has the usual number of longitudinal sills, but they are spaced rather differently, the center and adjoining spaces being approximately 20 inches and those next to the side sills nearly 12 inches. As this arrangement does not admit of the platform timbers being fastened direct to stringers, the required number of cross blocks are framed in between these. The stringers and side sills, both of Georgia pine, are framed to the oak end sills in the usual manner. The bolsters are of the combination pattern, being composed of three pieces of oak and two iron bars applied vertically; they are trussed with two sets of rods and straps each.

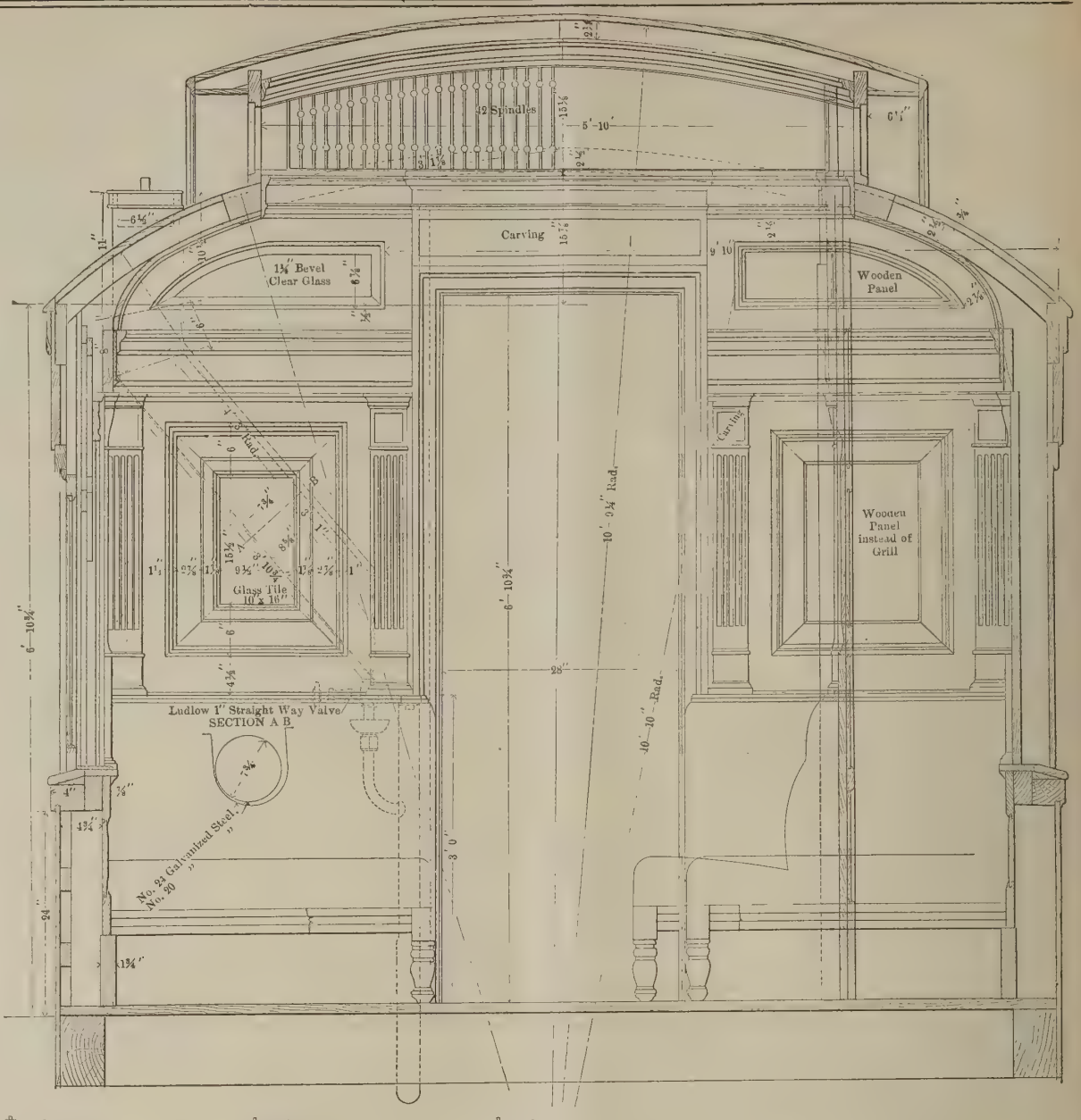
The needle beams are of oak and are placed 10 feet 6 inches apart and set on edge. There are distance pieces framed in between the longitudinals immediately above the needle beams and bolsters. There is no other cross-framing in the floor frame except the braces, are so considered, which are also peculiar to this company's cars. These are of oak let in flush with the top edges of the sills and secured with screws.

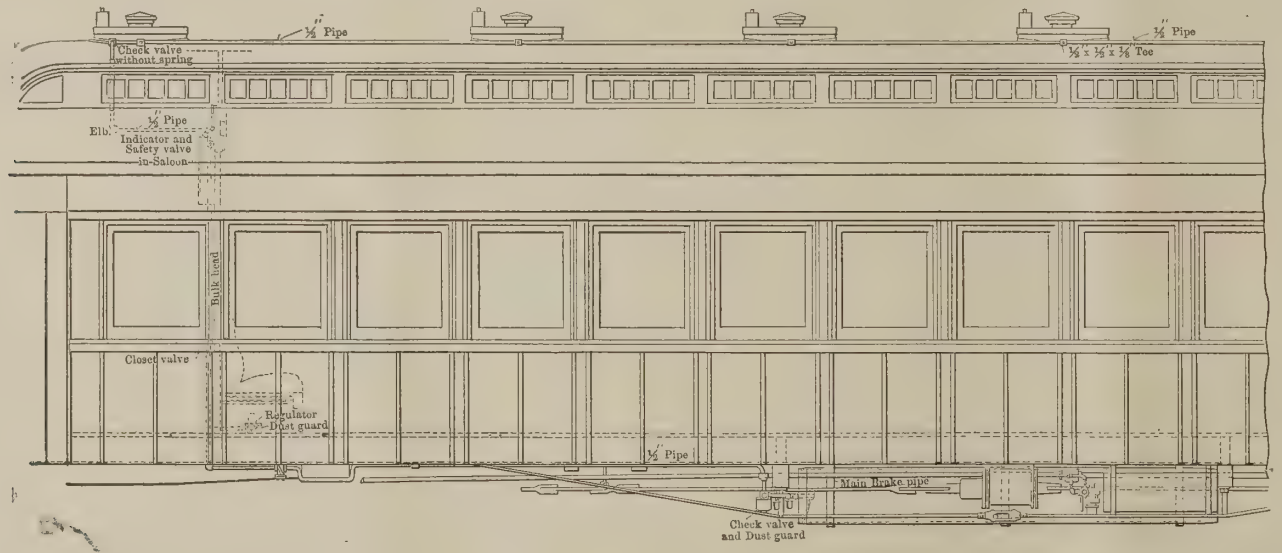
There are two body truss rods and these are located near the inner side of the intermediate floor timbers; they extend through the end sills where the nuts are let in flush.

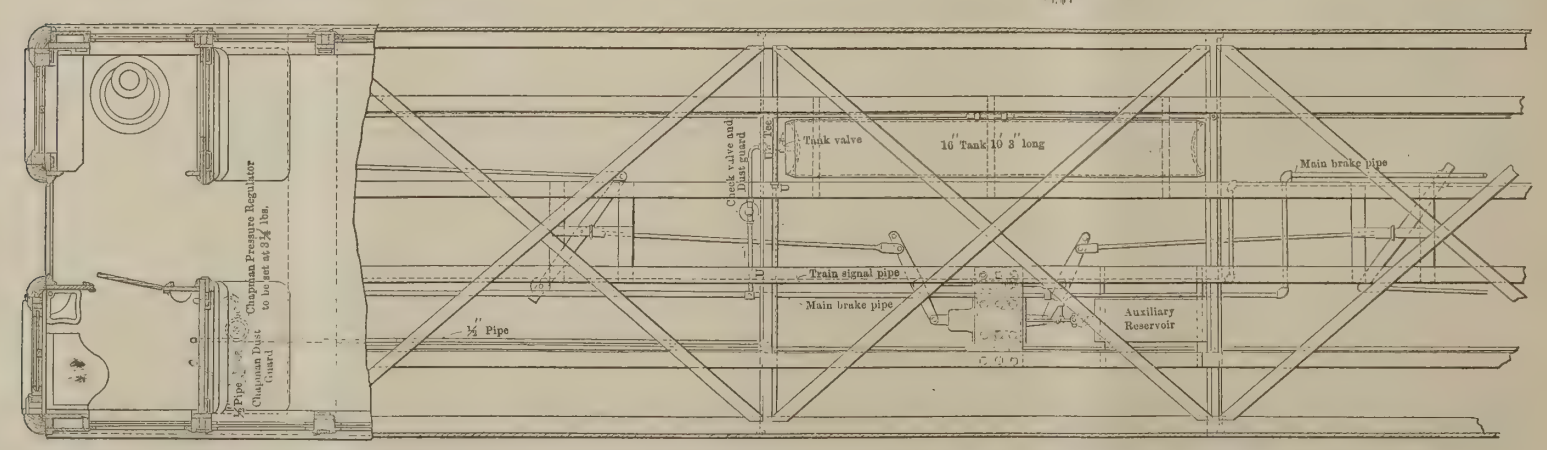
The floor is single and is composed of matched pine boards laid *across* the frame as shown. The deafening floor is cut in between the longitudinals and rests on cleats secured to the sides of these. The space between the two floors is filled with mineral wool.

The platform knees are of hickory and the headers of oak. The framing is such as is required by the Janney couplers with which these cars are equipped. The steps are of the combination pattern, the wooden treads resting on an iron frame work.

The framing of the superstructure is also in many respects different from that usually employed. The posts are of white ash, belting, nailing strips, carlins, etc., which are also of ash, are all framed in the usual manner. The most notable difference from other cars is in the construction of the side plates; these are set on edge, being secured to the posts in about the same manner as a belt or nailing strip is. With this construction the window sash and blinds can be raised up out of the way until stopped by the roof boards.






Chapman Pressure Regulator to be set at 3¼ lbs.
Chapman Dust Guard
Check valve and Dust guard
Tank valve
16" Tank 10' 3" long
Main brake pipe
Train signal pipe
Auxiliary Reservoir

The side frames are made to assist the truss rods in carrying the weight of the car by the introduction of diagonal brace rods; these extend from and through the sills and belt rails, which latter are for this reason made much more substantial than usual. As this arrangement, however, does not sufficiently support the ends of the car the usual iron truss rod employed for this purpose is added. The side frames of the upper deck differ from others only in that the numbers constituting these, being finished, do not require to be cased.

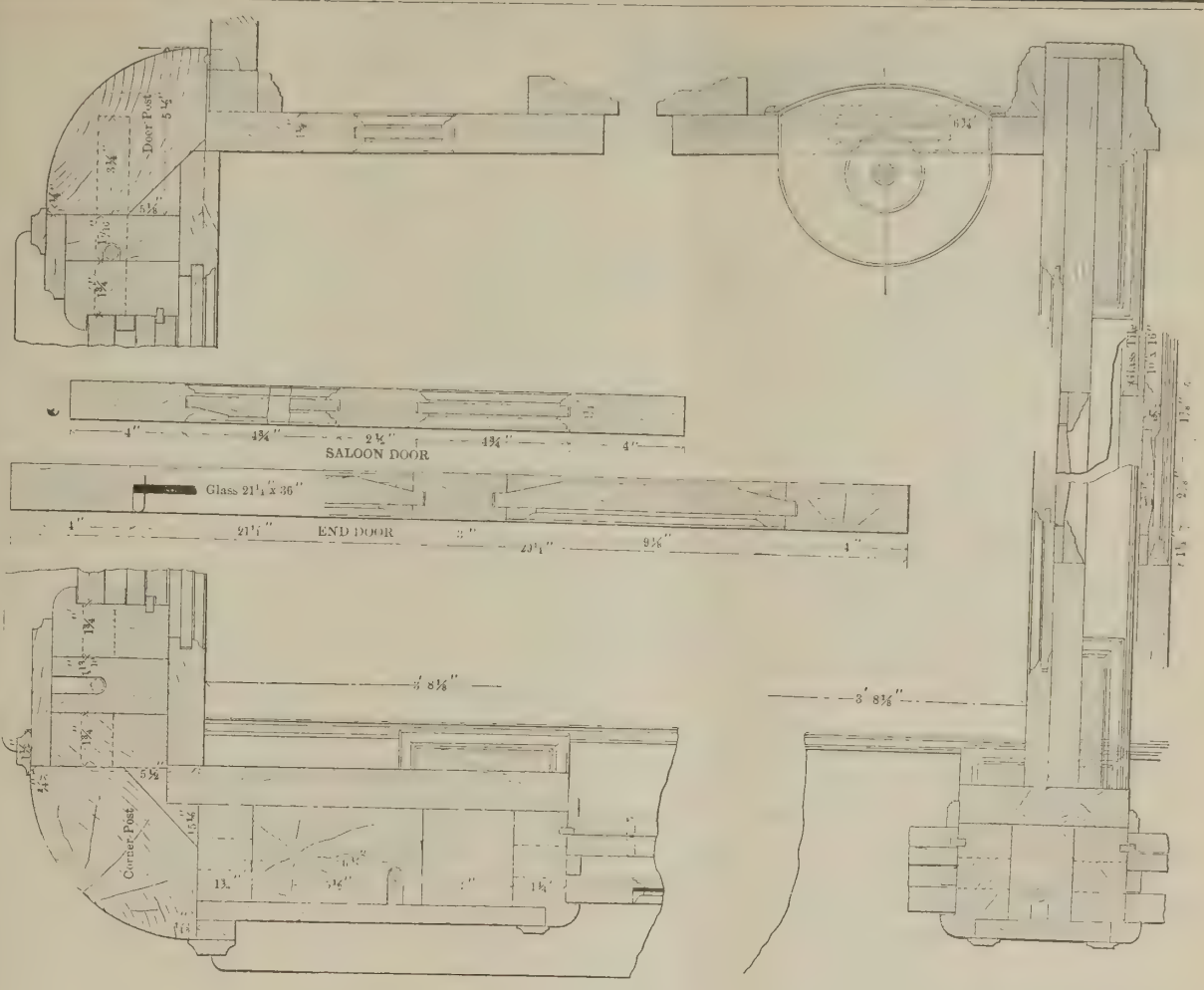
The exterior is covered with yellow poplar panels, letter-boards and battens. The roof boards are of matched pine and the covering is leaded iron of .019 inch thickness.

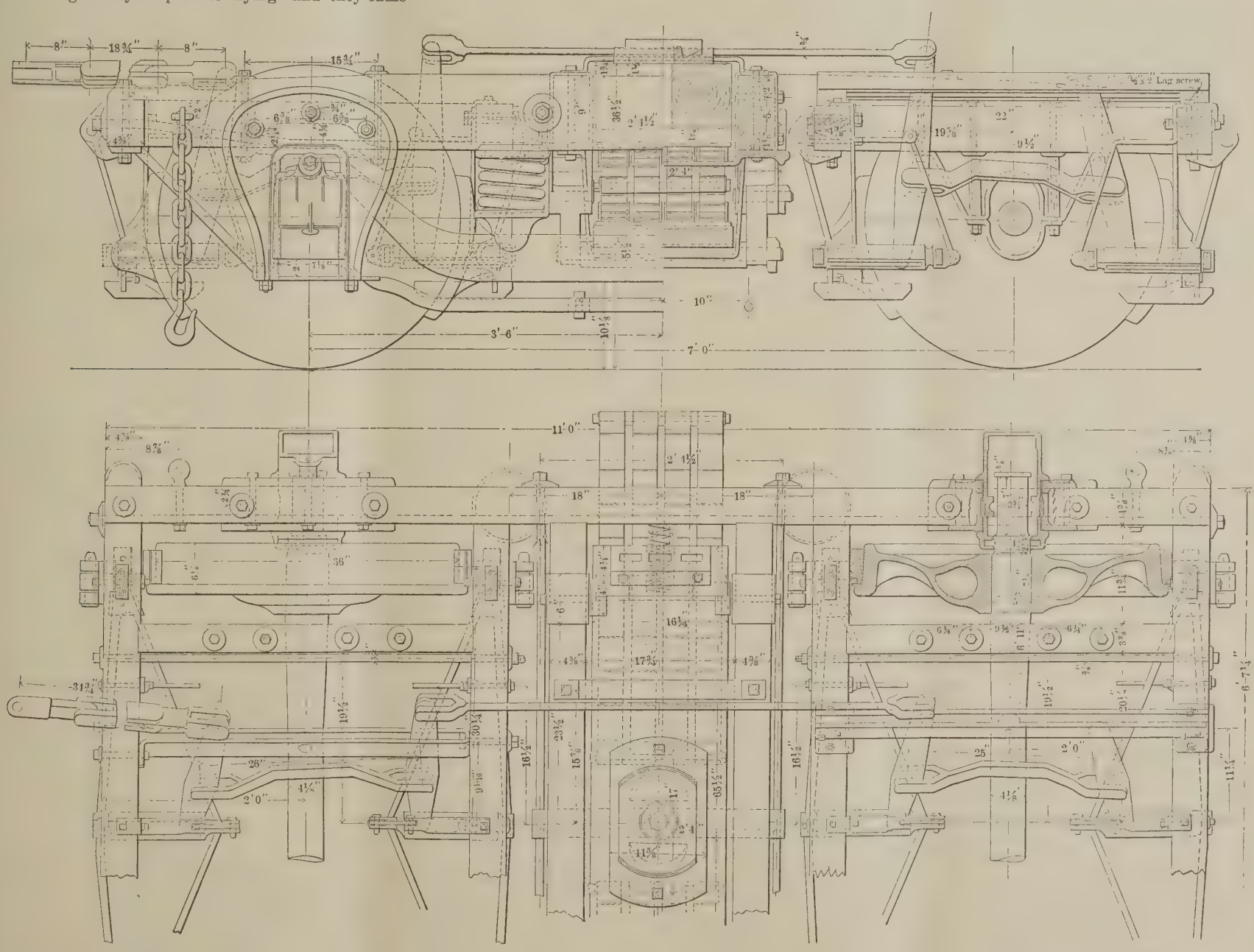
The interior finish, including the doors, window sash and blinds, is of quartered oak and of a design particularly pleasing and appropriate. The ceilings are of Armure silk applied so that it is entirely free from bagging; they are painted with some harmonizing color, and their only ornament are brass headed nails applied in a symmetrical pattern. The door and sash locks and lifts, hat racks, etc., are of brass and of a suitable design. The window and door glass is polished plate.

The heating of these cars is provided for by two Spear side-heating stoves and the ventilation by movable deck-sash, which are hinged at the ends and move outwards. The cars are lighted with the Carburetter system, the lamps for which are furnished by John Williams, New York. In addition each car is equipped with two candle lamps of the same general design; these are to be used only in case the others fail. The closet is lighted by the Carburetter lamp

placed in the vestibule, a glass panel being placed in the ceiling for that purpose.

The trucks are of the four-wheel pattern, have a 7-foot wheel base and 36-inch chilled wheels. It must be noted that the principal timbers in the truck frame are of white ash instead of oak as usual, and also that the brakes are applied to both sides of the wheels; the brake beams are of iron of the Westinghouse pattern.





A Runaway Tricycle.

The tricycles which telegraph linemen, roadmasters and others use as vehicles of transmission over railroad tracks provide the means of manual locomotion for a small amount of power. For the speed that these tricycles can be worked up to by the lever provided, the vehicles are a success and fairly safe, but they are badly calculated for express speed and they are daring men who ride these three-wheeled jumpers at a speed above twenty miles an hour. It is told that a lineman on a northwestern railroad recently made a flying trip on one of these machines. He coupled on to an express train with a wire intending to let go when the train got over a steep hill that rose from the starting point, but when he got to the top of the grade he found that the pliers for cutting the wire had been jerked out of the tool box. The speed kept increasing rapidly and the man kept trying to undo the connection, but the tricycle jumped and plunged in such a fashion that he could not let go. It was worse than being connected with the handles of a galvanic battery. As the lineman vainly struggled to disengage his tricycle from the train a curve was reached. Curves are not adapted to three-wheeled vehicles running at high velocity, and the tricycle attempted to keep going in a straight line. This effort was resisted by the coupling wire. The composition of forces inclined toward the heavens, and thence tricycle and rider went on a brief effort of flight. They were like the pig in the song—badly adapted to flying—and they came back to mother earth with a multitude of contortions. Singularly enough the lineman escaped with a few bruises, but the tricycle—a farmer who came along shortly after swore that some miscreant had put his old harrow on the track and the locomotive had mashed it into that shape.

Hollow Stay-bolt Iron.

The West Shore Railroad Company and several others whose mechanical men have become fully impressed with the danger of broken stay-bolts in locomotive boilers, have adopted for the making of stay-bolts a good quality of Tennessee iron, rolled with a small hole about ⅛ inch diameter in the center. This makes a hollow stay-bolt that is strong enough to resist the severe strains of service, and will always, without fail, indicate fracture. At the same time the opening is not large enough to admit an objectionable volume of air. From what we have seen of other hollow stay-bolts we are inclined to think that the hole in the center is to some extent a preventative of that crystallization of the metal which shortens the life of so many stay-bolts. The drilling of a hole through the center of the propeller-shafts of ocean steamers has been resorted to for the purpose of preventing crystallization, and it is highly probable that the same remedy is efficacious in the case of stay-bolts.

When mechanics examine the iron rods from which these hollow stay-bolts are made, with a small hole in the center, their curiosity is nearly always excited as to how the hole was formed. The most of this iron used is made by the Hollow Stay-bolt Company, of Cuyahoga Falls, O., and the operation of rolling the rods is thus described: Two pieces of iron rolled in U-shaped sections are laid together and wired in that position. These parts are then heated to a welding heat and run through rolls. As the welded tube comes from the rolls it passes over a mandrel, which fills the interior. Before reaching the second pair of rolls it cools slightly and shrinks upon the mandrel. In the second pair of rolls it is drawn from the mandrel and the interior cleared of slag and cinder. In this way, by five repeated operations, a hollow stay-bolt is obtained, which has a uniform interior diameter. The material is Tennessee bloom charcoal iron and is made in lengths of about 6 ft. and from ⅞ in. to 1¼ in. outside diameter, with any size hole desired, from ⅛ in. to $\frac{9}{10}$ in. A considerable saving in expense can be made by using hollow stay-bolt iron instead of drilling the ends of the bolts after they are in position.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

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DISCIPLINE IN RAILROAD SERVICE.

At the spring meeting of the Time Convention held in New York last month President H. S. Haines made an admirable address on "Discipline in the Railroad Service." He treated his subject in a broad, kindly light, and held that discipline was the teaching or training of certain persons that they may be better fitted for the work which they are to undertake. The raw material from which railroad men are formed comes from the ordinary walks of life, and it has to be molded into serviceable shape by training. The material should be picked over and the selection or weeding out performed before unsuitable men are admitted into the service. Examinations should be held to test the physical, mental and moral fitness of the candidates for railroad life, and the unfit should be rejected before they put their foot on the first step of the ladder as brakemen, engine-wipers or messenger boys. The flagman, the fireman, the telegraph operator, should be able to see and to hear, to read and to write, to keep sober and to tell the truth, and it is due to the public that they serve, and to the employés with whom they serve, that their ability to do these things should be tested before they are tried and found wanting in actual service. The establishment of preliminary examinations should assure to those who have passed them a prescriptive right to employment as opportunity offered; and after it had become well known that the holder of a certificate would have precedence for employment over those who were not so equipped there would be no difficulty in obtaining material so selected for training in railroad service.

With the admission of a raw recruit into the railroad ranks should begin his special training for the particular branch in which he is to serve; the acquisition of manual dexterity in his calling, of aptness in observing and imitating the operations in which he is to take a part, and especially of a knowledge of the rules and regulations which are to guide his conduct. Knowledge of rules is highly essential to all those connected with the movement of trains, and it was strongly urged that a knowledge of rules should be taught to all beginners. After a sufficient time has elapsed every man who has entered railroad service should be examined on the rules, and his continuing in the service ought to depend on his passing. To render the train rules a safeguard against accidents has occupied so much the minds of managers that it is not asking too much of the employé to show that he understands them before placing him in a position where failure invites disaster.

But knowing is one thing and doing another. Many men are able to do things, which, through indifference or neglect, or recklessness they fail to do. Railroad managers must make sure that the men will apply their knowledge at the proper time, and training must be resorted to to make this a certainty. It must be made to the men's interests to perform their duties properly, and they must be offered the time-honored inducements of reward and punishment. From the highest heavens to the lowest depths, this has been the mainstay of lawgivers, both human and divine, and it must also be that of railroad managers, that is, there should be a penal code to insure the observance of these rules by those who, in the absence of such a code, would not respect them. But for a system of rewards and punishments to be effective, it must be a system indeed. It must, as far as possible, protect the employés against the results of malice, bad temper or hasty decisions on the part of his immediate superior. A man should lose neither his job nor his pay, except for a clearly established violation of a rule with which he is familiar; his side of the case should be heard before judgment is pronounced, and the penalty should be graded to suit the extent of his offence. All this requires patience and self restraint on the part of his judges, and if they are lacking in these qualties, not justice, but injustice, will often be done. It is not sufficient then to publish a well-devised set of train rules and feel that your duty as to enforcing them has been done if you suspend or dismiss some one whenever there is an accident. Your duty requires you first to see to it that every man put under those rules shall know what is expected of him, next that there shall be such an inspection and supervision of their work that violations of rules are detected before a bridge falls down, a derailment takes place or a collision occurs; and further that punishment shall follow swiftly upon the heels of the offence—not capriciously, nor hastily, nor abusively, but the violation must be brought home so clearly to the offender that he has to acknowledge his shortcoming and in some way to suffer for it. It is not so necessary that the penalty be severe as that it shall be certainly and justly inflicted. The case calls for patience and self-restraint on the part of his judges; but surely the purpose in view is worth all that it will cost, and it is part of the value of true discipline that it acts beneficially upon the superior as well as upon those placed under him. A proper sense of discipline will prevent abusive language or tyrannical conduct as well as disrespect or disobedience.

The address throughout was a plea for the selecting of good men, seeing that they understood the duties they were expected to perform, and holding them to strict accountability, not only to the company they served but before the courts if violations of rules caused disaster. If there was more practice of Col. Haines' precepts by those in authority, the worthless element would be excluded from train service, and there would be more harmonious relations between railroad companies and their men, and there would be much fewer causes for appeal to courts or to committees.

PROGRESS OF ELECTRICAL TRACTION.

Three or four years ago, when electric motors began to be applied to the operating of street railways, many electricians were so enthusiastic about this method of transmitting power, that they freely predicted that within a few years electricity would be used to operate all kinds of railroads. In these days the managers of elevated railroads were constantly harassed by inventors of electric motors, who were prepared to move trains at half the cost of doing the work with locomotives. The electric motor did not find a place on steam railroads, but it rapidly took possession of street railways, and was found to be an excellent substitute for horses; but we hear very little now about electricity for operating elevated and other railroads where a great deal of power is necessary. The experience in operating the street railways, where comparative small power was required to do the work, has given electricians insight into the difficulties of applying power to transportation that has greatly toned down their enthusiasm. They find enough to do attending to the details of operating street cars regularly and economically without looking for wider fields to flounder through.

When electric motors were first urged into use for operating street railroads, their advocates insisted that the adhesion of an electric motor was much greater, in proportion to weight, than that of a steam motor, and that consequently much lighter machines could be used than would be necessary with steam as a motive power. The fact that the rotative effort of the electric motor is constant throughout the whole revolution of the driving-wheel, produces, no doubt, less tendency to slipping than steam, which fluctuates on different points of the stroke; but this appears to be the only adhesion advantage gained by the use of electricity. The light machines that were first put into service demonstrated that a successful electric motor required nearly as much weight on the driving-wheels as science had decided was necessary with steam motors. That class of men who are inclined to cling to an erroneous idea, long after its fallacy has been made plain, have tried to make out that motors lighter than the weight called for in the ordinary traction rules could be employed to advantage, but electric street railway engineers, as a rule, have kept increasing the weight of their motors till they are now about the same weight as steam motors, designed to do the same work.

Before experience crept in to etrude error, there was a prevalent belief that electric motors would be much easier kept in running order than steam motors, and that was advanced as a claim for the displacement of ordinary locomotives by electric motors. The president of an electric street railway, who appears to have given the subject of operating expenses close and intelligent study, in an address lately, intimated that the most difficult problem taxing the minds of managers was how to keep electric motors out of the repair shop. He assured his hearers that electric railway companies were perpetually annoyed by their motors; a lame armature, a burnt field magnet, a broken gear, are every-day trials. The armature of an electric motor is its wonderful and interesting, as well as most expensive and troublesome part. Where the coils of wire cross around the head of the armature, they chafe on each other and destroy their insulation. Where they end in the commutator, they loosen. By an excessive load or careless driver, they burn out. Failure happens invariably at the time the car is most urgently needed. Gears and bearings can be watched and replaced, or repaired when they are worn, so that with care failure can be prevented; but an armature gives out without warning or notice that it needs attention.

That picture is not encouraging for those who assert that electricity is the coming power for surface railroads. The motor's mechanism is only one of the numerous members of the circuit liable to get out of order at any moment without warning. The experience with street motors has shown anew to another class, what all railroad men have long been familiar with, viz: that a piece of mechanism which may work satisfactorily on a substantial foundation, is very unreliable when dancing over the low joints and other irregularities of a railroad track.

THE RIGHT TO REPAIR PATENTED ARTICLES.

We have heard the question repeatedly raised by railroad men of late, Can we have patterns made to renew the parts of broken car-couplers without obtaining permission from the patentee? This matter has been definitely settled in the courts in relation to other patented devices. The rule laid down by the United States court is, "Where a patent covers as an entirety a machine composed of several separate and distinct parts, the purchaser of such a machine from the patentee will not infringe by replacing such parts as wear out, as often as is necessary, so long as the identity of the machine is retained. But if the patent is for a separate and distinct element of the combination, a purchaser will infringe by replacing such element."

This means that if the knuckle, for instance, should be the only patented part of a coupler, or, if it should be covered by a separate patent, it would be illegal for a railroad company, or an agent acting for them, to make new knuckles; but if the knuckle is merely a part of the patented coupler, new ones may be made for repairs without infringement of the patentee's rights. In cases where the railroad companies can legally make pieces to repair a patented article they are at liberty to employ other manufacturers to do the work. The company, or any one in its employ, is under no obligation to use the same kind of materials in repairing as were used in the original manufacture, and these may be replaced by better materials.

BOILER CONSTRUCTION.

In another page will be found a comprehensive abstract of the paper on boiler construction read by Mr. John Hickey before the Western Railway Club, which is well worthy of study. There is nothing particularly novel about the design of the locomotive boiler that supplies the text for the paper, but it is a good sensible form with a few changes from the common wagon-top type that has so long held popularity with American master mechanics and locomotive builders. Mr. Hickey retains the wagon top, but binds the crown sheet of the firebox to the outside shell by means of radical staybolts, the wagon top being extended forward a sufficient distance to make room for the dome, a practice followed by the Chicago, Milwaukee & St. Paul and other roads that favor the wagon top and yet prefer radical stays to crownbars.

There are several details in which we differ from the views favored by Mr. Hickey in his boiler designing, but we presume his practice will have the support of the majority of the engineering fraternity. He uses rods that pass entirely from front to back for binding the front and back of the boiler. This is a common practice, but we never saw it used where the braces did not give more or less trouble leaking and breaking. They are so long that the vibration of the engine shakes them loose and eventually leads to fracture. Shorter braces fastened to the shell do not look so mechanical, but they give better service. We hardly approve of the shallow dome, but the plan of setting the tubes adopted seems a decided improvement over current practice. Mr. Hickey has for years devoted special attention to working out means of improving the circulation of water in the locomotive boiler and his arranging of the tubes in vertical rows with liberal space between is an attempt to give his ideas practical application. What appears to us as merely a theoretical argument was advanced in favor of 2¼-inch tubes. As the boiler illustrated had 2-inch tubes, it may be inferred that Mr. Hickey was not quite convinced that the larger size were best. The experience of those who are using tubes larger than two inches is not of a character to tempt others away from the smaller size. The making of the firebox crown and sidesheets is an innovation that strikes us favorably, although the crown has generally been made of thicker sheet than the sides. We also believe

with Mr. Hickey that mud drums might be employed to advantage where the feed water is bad although the current tendency has been to abandon this attachment to the boiler.

SHARP PRACTICE UNDER TECHNICALITIES.

Among the cases of disputes about interchange of cars, decided by the Arbitration Committee recently, and reported in another column, is one that is a very good illustration of how strained relations are intensified and perpetuated between companies that interchange cars. It also emphasizes the necessity for strict rules of interchange, so that companies that are not inclined to act fairly may be forced to be nearly honest. A foreign car was in the yard of the Cincinnati, Sandusky & Cleveland, waiting for delivery to the Chesapeake & Ohio, but the latter road would not accept it without a card for some acknowledged defect, and the car inspector belonging to the delivering road was absent, and there was a prospect of the car being delayed to await the return of the inspector. At this juncture, an inspector belonging to the Columbus, Hocking Valley & Toledo, who happened to be in the yard, good-naturedly offered to overcome the difficulty, and, with the consent of the receiving road, he put on a defect card belonging to his own road, but erased the name, and wrote that of the Cincinnati, Sandusky & Cleveland, which was the road receiving the favor. This good-natured inspector explained to the inspector of the C. S. & D. road what he had done, and the action was praised and accepted as a favor. But when the officers of the Chesapeake & Ohio, after performing the repairs called for on the card, sent the latter as testimony that the delivering road was responsible for the cost of the work done; the Cincinnati, Sandusky & Cleveland promptly repudiated the claim on the ground that the card was not put on in strict accordance with the M. C. B. rules. Although everyone must have been convinced that the claim was just and honest, and that the rejecting of it on a technicality was a piece of contemptible meanness, the Arbitration Committee had to decide against the claim. This is the kind of treatment that arouses a spirit of retaliation. The Chesapeake & Ohio people no doubt consider that the Cincinnati, Sandusky & Cleveland has crawled out through a remarkably small hole, and that in future cars belonging to that company will receive no relaxation of strict rules if they should stand at interchange points till they rot.

THE BLOCK SYSTEM OF SIGNALS.

At the April meeting of the New York Railroad Club Mr. G. H. Paine read a valuable and interesting paper on "Block Signaling," which is a seasonable contribution of information on a subject painfully in need of dissemination among railroad men. Within the last few years decided progress has been made in equipping crowded portions of railroads with signals to aid in operating trains safely, but the work has merely begun, it is lamentably behind the needs of safety and economical working of railroads, and the majority of railroad officers have no conception of what can be done with automatic signals to prevent accidents. Ignorance and prejudice, as is always the case, go hand in hand, and many railroad managers refuse to equip any part of their crowded lines with block signals, because they have learned nothing about the value of these appliances. There are railroad companies paying monthly heavy bills for train wrecks that would be prevented by the use of a signal system which could be established and maintained for half the expense incurred by the destruction of property in train collisions. If those responsible for this condition of affairs could be made to realize that it was for the financial interest of their companies to adopt an efficient signaling system adapted to their requirements, they would be likely to recommend its introduction, but it seems impossible to inspire them with the requisite knowledge. In his book on Railway Accidents, Chas. F. Adams, mentions with evident surprise the ignorance about the block signal system displayed by the railroad superintendent, responsible for the Revere accident, who said that it would be impossible for him to run all his trains under a block system, although railroads were then running without delay under the block nearly twenty to one run on the road where the accident happened. That was twenty years ago, and in spite of all the volumes written about block signals since that time, and the public speaking on the subject, and the the establishing of block signals on parts of many railroads, there are still many railroad managers in the country who are not ashamed to tell that they could not handle their trains under the restraint of a block system.

The introduction of the block system of signals has proceeded so slowly in the United States that the people have not yet become properly aware of the safeguards its use provides to the traveling public and to railroad employés. There is an earnest demand existing now in many states for legislation to compel railroad companies to adopt the best known safety appliances on locomotives and cars for the protection of trainmen. When the truth becomes more generally known that there are perfected appliances whose use would materially add to the safety of all those who have to travel in railroad trains, the managers who profess want of confidence in block systems will obtain new light from the sources that showed the way to heat cars safely. Where a disposition is manifested to keep up with the procession of improvement, compulsion ought not to be imposed, but there are already many cases where nothing short of force will be effective.

SUGGESTIONS WANTED ON DESIGNING OF REPAIR SHOPS.

We would like to direct the attention of our readers to the illustrations on another page having the caption "Model Locomotive Repair Shop." The design of these shops has been worked out with great care after prolonged study by the mechanical officers of the road that proposes to build the shops. The men who have made the designs studied the arrangement of the most popular form of railroad shops in the country, and they have done their best to follow what they considered the ideas that would promote convenience in doing work. They, however, recognize the fact that a plan which looks perfect on paper may have serious defects when it is reduced to tangible form. They also are aware that many railroad officers who have designed shops have learned a great many things after the works were put in running order that they had no conception of before, and that in some cases the information was obtained in a rather expensive fashion. Wishing to profit by the experience and the ability of others, the designers of what we have called model locomotive repair shops invite the criticism of all of our readers who have any ideas on shop design. We should like to see the design thoroughly dicussed, and if any one can offer suggestions that will improve the plan or give reasons why any part of it should be changed, we feel certain that they will be doing a good turn, not only for those immediately interested, but for all those who have to undertake in the near future the work of designing repair shops.

We devote considerable space in this issue to reporting proceedings of the New England Railway Club and of the Central Railway Club, both of which discussed the subject of air brakes on freight cars. As a speaker at one of the meetings remarked, "the air brake on freight cars has come to stay," and it is time that the officials who are responsible for the condition of freight cars that are exchanged by railroads doing business with each other, should form rules to provide for freight car air brakes being maintained in working order when on foreign roads. At the last conventions of the Master Car Builders, and Master Mechanics' Associations, committees of investigation were appointed to report on the maintenance of air brakes on freight cars, and the proceedings at the clubs is the first ventilation of the subject. If we are to judge by the tone of the speakers at both meetings as representing the views of railroad men generally, there is likely to be changes made on the rules of interchange that will hold railroad companies responsible for the condition of air brakes on freight cars passing over their lines. The change will be considered a hardship by some companies at first, but they will soon become reconciled to it, and the problem of keeping the brake in order will be found an easy one to solve when the effort has once been made. The sentiment once recognized, by living rules, that the brake must be kept in good order, will do much to dissipate the carelessness and recklessness with which the apparatus is now frequently treated.

Several questions have lately been referred to the Arbitration Committee of the Master Car Builders' Association owing to extra charges being made on account of special attachments which were on cars that were destroyed in wrecks or fires. The rules of interchange of cars do not provide for the payment of anything beyond the value of a common car with the ordinary appliances, and the Arbitration Committee have had to rule against the extra charges; but it appears to us that the practice is manifestly unjust. The practice of using cars of superior form with attachments necessary for the safe transportation of particular kinds of merchandise is on the increase, and railroad companies that use the cars have the right to expect compensation for everything destroyed about their cars. The destruction of fruit cars, for instance, during a busy season is often the cause of serious loss from the company being deprived of part of its facilities for handling the freight offered, and it seems only meager justice at the best to ask for remuneration for the actual cost of the car. It is high time that a rule was established providing for the payment of all extra attachments belonging to cars destroyed.

The Lake Shore & Michigan Southern has been again the scene of a terrible train accident, resulting in the death of eight persons. At Kipton, O., an east-bound fast mail ran into a passenger train which was starting to pull into a siding to let the other train pass. The engineer and conductor of the west-bound train are blamed for the accident, since they had no right to be on the main line unprotected when the other train was due. It is all right to find subordinates conveniently to blame, but it is becoming apparent that something is radically wrong with the management of the Lake Shore when train disasters are so frequent. Why is it that we scarcely ever hear of accidents on the Michigan Central and other railroads doing more business than the Lake Shore, with similar facilities for handling trains? If that last accident had happened in New York City more persons besides the engineer and conductor would have been called upon to clear themselves of responsibility for the loss of human life.

A correspondent in this issue takes up in rather a caustic fashion the subject of mixed drawbars, discussed by a correspondent in the April issue. The difficulty of deciding what form of drawbar can be acceptably used on the cars belonging to some railroad companies is becoming so serious that it is time something were done to help in settling the matter. When a railroad company equips its cars with the vertical plane coupler there is no difficulty in deciding a question of mixed drawbars, since all those that conform to the M. C. B. standard may be used in repairs. We think it time for the Master Car Builders Association to select some form of link and pin coupler that might be legally used for repairs of all couplers that are not automatic.

We wish to direct the attention of our readers to the advertisement on page 80 for a superintendent. The company looking for a man to take charge of their machinery is a thoroughly reliable concern, doing a large business. The right man will find an excellent position.

Personal.

Mr. John Weekes, one of the first men to handle a locomotive in this country, died at Schenectady last month, at the age of 94 years.

Mr. H. C. Potter, vice-president of the Flint & Pere Marquette Railroad, has resigned. Mr. Potter rose from a clerk on the road to the high position which he has just relinquished.

Mr. Ross Kells, superintendent of motive power of the Erie, has been confined to bed for several weeks with severe sickness, but he is now able to be about in his room and is in a fair way of recovery.

Mr. A. L. Dunbar, for many years superintendent of the New York, Pennsylvania & Ohio at Meadville, Pa., has been appointed general agent of the O'Neil automatic crossing signal, with office in Cleveland, O.

Mr. Frank Bruce, who was for some time master mechanic of the Atchison, Topeka & Santa Fé has been appointed master mechanic of the Chicago & Eastern Illinois, in place of Mr. C. J. Clifford resigned.

Mr. E. Dickinson, who left the Union Pacific about a year ago, crowded out by the Adams interests, has returned to the road as virtual general manager, although his title for the present is assistant. He is a good representative Western railroad man.

Mr. Robert Miller, general superintendent of the Michigan Central, spent a few weeks in the South lately. He looked up many of the scenes that he passed through in the army 25 years ago. He marched through Georgia under Sherman's banner.

Mr. Joseph Cockfield, who has been for several years general foreman of the Chicago & Northwestern shops at Boone, Ia., has been appointed master mechanic at Clinton, Ia., vice Robert Quayle, resigned. Mr. Henry Gerlicher has been appointed in Mr. Cockfield's place.

Herr Von Borries, mechanical superintendent of the Hanover railroads and well known as patentee of improvements on compound locomotives, is visiting the United States. His agents claim that all intercepting valves are infringements of the Von Borries patents.

The Scotch residents of Scranton found that the fifty-eighth birthday of Mr. Charles Graham, master mechanic of the Delaware, Lackawanna & Western, came round last month, and they made a raid on his household in force in the evening, carrying some handsome testimonials of their good will.

The April number of *New York Railroad Men* contains a good portrait and biographical sketch of Mr. William Buchanan, superintendent of motive power of the New York Central Railroad. Mr. Buchanan has been with the company he has served so faithfully for upwards of 40 years, and he looks as if there were still twenty years of work in him.

Mr. W. G. Oakman, for some time first vice-president of the Richmond & Danville, has resigned and accepted the position of first vice-president of the Central Railroad of New Jersey. Mr. Oakman is a good practical railroad man and his influence will, no doubt, soon be felt in the operating of the Central, which can stand a good deal of improving.

The officers elected by the American Railway Association are: President, H. S. Haines (Savannah, Florida & Western); first vice-president, H. F. Royce (Chicago, Rock Island & Pacific); second vice-president, Lucius Tuttle (New York, New Haven & Hartford); secretary, W. F. Allen; executive committee, G. W. Stevens (Chesapeake & Ohio), C. W. Bradley (West Shore).

Mr. William Thow, locomotive superintendent of the Government Railways of New South Wales, has lately returned from a business visit to Great Britain and this continent. Among other things he was investigating the re-

lative advantages of cable and electric traction for the street railways of the colony. He is reported to have decided that cables can be employed more economically than electricity.

Captain Agnew, who has been superintendent of motive power of the South Carolina Railroad for the last two years, has been promoted to the position of general superintendent of the road. Captain Agnew has displayed great ability and tact in dealing with antiquated machinery and ancient habits of railroading, prevalent on the South Carolina Railroad, and the success he achieved in the mechanical department no doubt recommended him for a higher position.

Mr. B. Malloy has been appointed master mechanic of the Wisconsin division of the Chicago & Northwestern Railway, with headquarters at Chicago. Mr. Malloy has been for several years general foreman for the same company at Milwaukee. Mr. William Smith, superintendent of motive power, has adopted the wise policy of promoting as far as possible men already in the service of the company to all important positions in the mechanical department.

Mr. John A. Hill, editor of the *Locomotive Engineer*, is making a tour of the United States with San Francisco in the circuit. Mr. Hill hung to the radial center of our continent on the Denver & Rio Grande for about ten years and absorbed every anecdote about railroad life worth telling. He has the best eye and ear for the humorous of any man of our acquaintance, and we anticipate reaping pleasure from the gleanings of the present tour.

Mr. J. Davis Barnett, assistant mechanical superintendent of the Grand Trunk, with headquarters at Stratford, Ont., has the best engineering library in Canada. His general library is of very great value, and contains many bibliographic treasures. He has undoubtedly the best Shakespearean library in Canada, and it is doubtful if the rarety of the collection is equaled on this continent. Among the collection of art curiosities are most of the original Cruikshank engravings illustrating Dickens and other authors.

Mr. William H. McDoel has been appointed general manager of the Louisville, New Albany & Chicago, in place of Mr. W. F. Black, who has held the position for about a year. Mr. McDoel has been for some time traffic manager of the road, and is very familiar with the needs and peculiarities of the property. He has been for 30 years in active railroad life, mostly in Indiana and Illinois. Under the late management the "Monon" became noted for the number and serious character of the train accidents. We cannot say who was to blame, but there was presumably need of a change of management.

Mr. S. B. Tinker, master mechanic of the Cincinnati, Wabash & Michigan Railway, died of pneumonia at his home at Wabash, Ind., last month. Mr. Tinker, like many others of our railroad officers, pushed himself up from a humble beginning, with no help but his own unaided exertions, to a prominent and honorable position. At the early age of eleven years he was thrown upon his own resourcesfor making a livelihood. He went to work in a blacksmith shop where he continued for five years, and then entered a shop to learn the machinist trade. In 1854 he began railroad work as a locomotive engineer and followed the business for 21 years, gaining experience on various roads in New York, Michigan and Ontario. In 1875 he was appointed master mechanic of the Chicago & Lake Huron, which he left two years later to accept the position of master mechanic of the Cincinnati, Wabash & Michigan, which he held at the time of his death. He joined the Railway Master Mechanics' Association in 1889. Mr. Tinker was extremely popular with the men under his charge. He leaves a wife and two daughters.

The West Shore Railroad people make a reverse lever quadrant with very fine notches, and do not mark the points of cut-off. Those in authority have learned that working the quadrant does more to make enginemen wasteful in the use of steam, than anything else put on the engine. A quadrant is marked for certain inches of cut, and by some means the real cut comes an inch or two later on. Enginemen feel contented if they are working their engine to cut off at 6 inches, when all the time it is cutting off at 8 or 9 inches.

At the Boston & Maine Railroad shops at Boston, Mr. William Smith, general master mechanic, is doing his best to train apprentices that will make first-class machinists. Care is taken in hiring the boys to see that they are of the material that good mechanics are made of. They must be bright, fairly educated boys who have the ambition to learn the machinist trade. For the first four months they are put on bolt machines, the next four months they are drilling and filing upstairs among the light machines, then they go downstairs to the heavy machines, where they do similar work for four months more. This completes their first year. The first four months of the second year they work on reverse and throttle levers, then four months on brass work, succeeded by four months on valve yokes. That completes the second year. For the first eight months of the third year they work on valve rods and all other kinds of rods, the last four months of the year being spent on planers and slotters. The fourth year they do general floor wor.

Vanderbilt Rolling Stock Agreement.

A meeting of representatives of the mechanical departments of the Vanderbilt lines was called at the suggestion of Mr. W. H. Webb, to consider the status of the car coupler question and other car matters in which combined action is desirable. The meeting took place in the Grand Central Station, New York, early last month, and representatives were present from the Boston & Albany, the Michigan Central, the Lake Shore, the "Big Fours," and the Chesapeake & Ohio. The first question taken up was the cost of maintaining the vertical plane coupler in running order, as shown by the cost of those in service. Carefully collected statistics were submitted, and it was decided that the figures went to show that the vertical plane coupler was more economical than the link and pin couplers. There was reported to be a great difference in the breakage of the various types of couplers in use. The result of the conference was an agreement of the lines represented to use the M. C. B. type of coupler as standard, and for the present to restrict the orders to three makes of couplers, viz., the Janney, the Standard or Dowling improved, and the Gould.

The subject of car heating by steam from the locomotive was discussed in different bearings, and an agreement was made to investigate the different forms of heating-pipe couplers in use with the view of deciding upon a standard for all the Vanderbilt lines.

The question of air brakes for freight cars was also under consideration, and it was decided that recommendations should be made to equip all fast freight cars with air brakes as soon as practicable. It is the intention of the New York Central to run stock trains and other trains consisting of time freight on their passenger train tracks, and all the cars must be equipped with air brakes to do this safely. This is merely following the example set by several western roads that run their stock trains as fast as an engine can pull a moderate train. It is a common practice west of the Missouri to side track passenger trains to permit stock trains to pass.

Big Marine Engines.

Through the kindness of Mr. William Smith, Superintendent of Motive Power of the Chicago & Northwestern Railway, who was for some years an engineer in the Cunard Steamship Company's employ, we have received figures of the weight of the different parts of the engines of the steamers Umbria and Etruria, and other particulars about the immense engines which force the great vessels across the Atlantic at a speed of about 24 miles an hour, with a developed horse power of 15,000. The total weight of the engines is 2,080 tons. The engines are the triple expansion type, the high-pressure cylinder being 71 inches diameter and the two low-pressure cylinders each 105 inches diameter. The low-pressure cylinders each weigh 35 tons, and the high-pressure cylinder 22½ tons. The head of the low-pressure cylinder weighs over ten tons, or more than two sets of cylinders for ordinary locomotives. The low-pressure piston weighs over six tons, and its ring alone weighs two and a half tons. The crank shaft weighs 30 tons, and one connecting rod weighs over 12 tons. The steel tunnel shaft weighs over 20 tons, and the propeller shaft 25 tons. One boiler empty weighs 71 tons, and it holds 51 tons weight water, and there are nine boilers used, containing 72 furnaces. The smoke stack is 16 feet 9 inches diameter and weighs 36 tons.

There are on board the vessels about 120 men in the engineering department. The work of caring for the engines is performed in six watches of four hours each. Every man takes two watches a day, having four hours on and eight hours off duty. There are three engineers, three oilers, 18 firemen and 12 coal passers on duty during each watch. About 300 tons of coal is consumed daily.

Inventors of Perpetual Motion Machines.

Some of the most ingenious and persistent men are laboring on the hopeless task of devising perpetual motion appliances. Our educational system is in many respects responsible for so much mental energy being wasted upon fallacies. If natural philosophy and elementary mechanics received the attention in common schools that their importance demands, there would be fewer persons pestering their friends to supply funds for the development of apparatus intended to cheat nature's laws. Ignorance of the laws of nature is, no doubt, responsible for the majority of perpetual motion devotees, yet some men who are well educated become pursuers of the chimera. It is frequently difficult to understand the mechanical fallacies that creep over what are otherwise bright intellects. Electricity seems to be deceiving many men and leading them into the belief that by means of this mysterious force more power can be received than what is given. Since the electric lighting and electric transmission of power era began there has been a great increase in the applications to the Patent Office for protection of what are electrical perpetual motion machines.

For years the Patent Office income was considerably augmented annually by the receipt of fees from inventors of perpetual motion machines, but no fees are now accepted from men working on that kind of apparatus. A printed circular is sent to applicants saying that nothing short of a working model would be received, and as the inventor never gets a model of this kind to work, he can do no more with the Patent Office. A correspondent of the St. Louis *Globe Democrat* gives particulars of some curious recent perpetual motion cases. Mr. Keely has a good many imitators in a small way. A few months ago a New York lawyer went to Washington with parts of a machine, and had quite a controversy with the office because the patent was refused. He insisted that he had seen the machine in operation, that it was running day after day, and keeping a cider press going to boot. There was no deviating from the rule. The lawyer went back to New York, saying that he would produce the machine. He was not seen again until the centennial celebration this week, when he reminded the examiner of the case and told how he had been fooled. At the time of making application the lawyer really believed that his client had discovered the long-sought principle. But when he got back to New York and told that the patent had been refused the client confessed. The perpetual motion was no motion at all. Power was concealed in the cider press. It ran the press and the press made the perpetual motion machine go too. The inventor had been charging 10 cents admission to see perpetual motion. He had fooled the public and his lawyer, and he hoped to slip through a claim.

A Case of Gears vs. Belts.

Among the more notable of the tools seen in process of construction are some that are being built for the Westinghouse Air-Brake Company for finishing brass cocks and valves. They are turret-head machines in which the turret has a movement across the bed as well as in line with it, all feeds being automatic and obtained without the use of gear or racks. Most mechanics, I think, who have had experience with good gearing would be inclined to think that, if a particularly steady and uniform feed were dedesired in such a machine as this, the way to get it would be to start with a rapidly moving belt, and reduce the speed by the best of gears, or use gears exclusively. But when the Westinghouse company came to order these machines their superintendent insisted that they had tried geared machines for this work to their entire satisfaction, and that the result of using them was invariably to cause ridges in the surface of the work, which gave trouble in the subsequent grinding to obtain the air-tight fits necessary. He wanted the machines constructed without gears, and the feeds are therefore driven by round belts running in grooved pulleys, and driving-screws which give motion to the various slides. The arrangement of the details was a work of some difficulty, but it has been very satisfactorily done, the first machine proving so efficient and satis, tory that eight more have been ordered.—*F. J M., in American Machinist.*

Michigan Central Compounds.

The compound locomotives in use on the Michigan Central are doing remarkably good service on the heavy fast passenger trains run by the company. No. 284, the first compound built by the Schenectady Locomotive Works has now been at work seventeen months, and doing remarkably hard running all the time. She runs between four and five thousand miles a month. There is no indication yet that she will be harder on repairs of machinery than the other ten-wheel engines doing similar work, and she is decidedly lighter on boiler work. Her flues have not yet given the least trouble with leakage, white all other engines have to get their flues taken out and the boiler cleaned before they make the mileage now accomplished by the compound.

During the month of March No. 284 ran 4,640 miles, and burned 130 tons of coal, averaging 35.7 miles to the ton. No. 280, one of the ten-wheelers of dimensions similar to the compound, in doing the same work made 27.1 miles to the ton of coal, and No. 281 ran 31.5 miles to the ton of coal.

Rough Fare for a Bridegroom.

Mr. A. J. Earling, general manager of the Chicago Milwaukee & St. Paul, likes to loosen his collar and talk of by gone experiences of railroad men in the wilds of Wisconsin and Minnesota.

He has got no use for inferior telegraph operators. His aversion to poor sticks in this capacity dates back from the time he was train despatcher, wrestling with the plugs that were then numerous on the system.

"In those days" he said, "the best class of telegraph operators did not come to the Northwest, and we some times had difficulty in giving orders through the 'plugs' on hand. I remember a funny case when Mr. Blank, of Farley, went away to be married. An ordinary specimen of extra operator was acting in his place. One day I attempted to give orders to the conductor and engineer of a train that was at Farley and it seemed as if the operator could not take two words without breaking. Getting out of patience I asked, When will Mr. Blank be back? 'As soon as he gets wood and water, was the prompt answer.'"

Communications.

Draft Appliances.

Editor National Car and Locomotive Builder:

The extracts from Mr. A. E. Mitchell's paper, published in the NATIONAL CAR AND LOCOMOTIVE BUILDER, the Editor's comments on the same, and the valuable article on the same subject, from the pen of Mr. W. H. Elliott, have afforded me much interest and profit. All these corroborate an opinion I have maintained and advocated for some time, concerning the draft of locomotives. These articles have broached a very important subject, one that should receive careful consideration by those whose duty it is to arrange and proportion the drafting appliances. It should be thoroughly ventilated by proper discussion from mechanical standpoints. It is in this way that we can gain a more perfect knowledge of the most successful method of creating the most complete artifical draft on a locomotive, fire box, or the fire in a locomotive.

An instance of two locomotives built by the same locomotive works, and after the same specifications, has come under my observation where the open, straight smoke stack and their appliances were put on by different master mechanics. The one steamed fair, the other was a torture to get over the division. Investigation showed that the diameter of the former's smoke stack was about four inches smaller than the latter's, and some difference in the arrangement of the diaphragm.

I once fired a locomotive that was a free steamer, and very light on fuel. The netting in the front end was made of very fine wire, and was pretty well patched. This necessitated its being replaced by a new netting. The first trip afterwards the engine steamed like a fresh one altogether, not generating steam so freely as usual. Inspection disclosed the fact that nothing had been moved, and that the new netting was composed of much coarser material than the old. Interrogating the official at the shop as to the change in material, his reply was that it did not require so much attention in the line of repairs, and it would not be necessary to replace it so often. And, hence, it was better than the old. It was of the same mesh, and could not impair the draft any way. A little manipulating with the diaphragm made the engine steam a little more freely, but made a perceptible difference in coal consumption.

Another example where the exhaust nozzles were lowered about four inches made a marked improvement in the steaming of an engine.

Inquiry and investigation show that the diaphragm that diverges from the top row of flues at an angle of about 50 degrees gives the best result on the fire. The diameters of the smoke stacks and the exhaust nozzles are governed to some extent by the kind of fuel used, but the smoke stack giving fair result for different classes of engines seems to range from 13 to 16 inches in diameter.

Hence inquiry, observation and experience have demonstrated to me that the fundamental elements to be considered in obtaining a nearly perfect artificial draft on the locomotive fire are chiefly these: The diameter of the waist of the smoke stack, the height (or position) of the exhaust nozzles, the angle of the diaphragm from the flue sheet, and the netting.

Experience and observation have taught me that no matter how skilled or experienced a fireman may be when any of these apparatus are not properly proportioned or adjusted, the steaming qualities of such engine are greatly reduced; but, when all these component parts are properly designed and adjusted, they act in conjunction on the fire and thus a more perfect combustion is obtained in the firebox. There seems to be a certain relation existing among these drafting factors that has not yet been fully ascertained.

J. F. B.

Mixed Drawbars.

Editor National Car and Locomotive Builder:

In April number of your paper "J. C." has opened the ball on a very much troubled subject. He suggests that means be taken to simplify this question for car inspectors, that a circular be issued, etc. This is open to criticism, and, to occupy common ground, I offer as an axiom, that the system of car inspection should be so simplified that at interchange points the least possible delay should be encountered by the traffic, and that causes of friction between car inspectors should be reduced to a minimum. This will be admitted by the operating department of railroads, and was no doubt in the mind of "J. C." when penning the article.

The circular to be effective should state the length and height of drawbars and also have cost of same, giving the number and series of cars that are intended to be offered at interchange points. Then a copy of this circular must of necessity be sent to every interchange yard on this continent. (I presume it will be safe to give no smaller bounds to the wanderings of a freight car.) Then the car inspectors can commence studying these circulars, for there may be a plurality of roads with rolling stock in the condition described by "J. C." so as to be ready to decide instantly on any case submitted to them by their men. Then it may work in this manner with the wheel tappers, they may be inspecting trains a mile away from the office, find car or cars with mixed drawbars to make themselves reasonably safe, these cars they will hold till the oreman has seen them or until the circulars have been examined and compared with the cars; to do this one man may have to walk a mile, cross over or under from three to thirteen side tracks loaded down with cars, and on his return with the desired information the car or cars for mixed drawbars may have been a subject of delay by being thrown on to the cripple track. This, no doubt, will be admitted would be the probable result of the usual routine of an interchange yard. To return to the premise:

Railroad companies whose equipment of cars consist of many and various kinds and builds of cars with the usual improvements to them, wishing to use them in through traffic, might, it seems with safety, fit these cars with a *cage* for defect cards, whose faces might bear a statement to the effect that the owners would receive it with mixed drawbars of a certain material, pattern, size, length or weight as the case may be.

Or this card might state, the owners of that car bearing card should receive it with any mixtures of drawbars. It must be always borne in mind that it is for the benefit of the owners of cars that mixed drawbars are allowed to obtain free and untrammeled passage over the land, and these owners in fairness should be willing to facilitate the easy and quick movements of these cars through interchange yards.

DOPE BUCKET.

Single Engines and Reduced Fares.

Editor National Car and Locomotive Builder:

I notice in the April number of the *Locomotive Engineer* an article from a mechanical engineer. In the fourth paragraph is this extraordinary statement: "It is not the province of a railroad man to build and plan locomotives."

Now, it seems rather strange what railroad men have been employed for during the last sixty years if it is not to attend to railway affairs. It might just as reasonably be said that a firm building mining machinery should give the management of its shops to a man who was driving a milk wagon. The probability is that this machinery would be worth just about as much as the few locomotives that have been built in this country by those who were not railroad men, and that are worth nothing.

It is time the writer of the above-mentioned article learned that there are as smart men on the railways of the country as there are in any other branch of business. And it is more than likely that after their years of experience these men know more about the practical and available construction of motive power than these outsiders who very probably could not get an engine over its trip without losing the water, having the steam pressure run down, sticking on a grade, or fail to reach the terminal at all. And yet these men pretend to know just what is wanted to meet all the complication of requirements on the road. It is much more advisable for men to turn their attention to what they have had experience in and not try to interfere with that which they know nothing about.

In the March number of *Locomotive Engineer* is another article in which is "by the introduction of steel rails, locomotives can now carry as much 20 tons on a single pair of driving-wheels, where before 14 tons was the maximum load." Now it has always been the objection to putting excessive load on the drivers, that the journals could not be kept lubricated and cool, and also the greatly increased wear of tires, yet in the above paragraph these two most important items are not considered.

On the fast trains between New York and Philadelphia the average coal used per train mile is given as 50 pounds. Then the writer goes on to say: "Why not adopt the single locomotive of the English type, and reduce the time between these points to 90 minutes and the coal used per mile to 30 pounds in place of 50?"

In the above mentioned article is:

"The adoption of single locomotives in England has made a saving of about 10 per cent. of the entire passenger locomotive coal bills."

It does not seem at all clear how American single engines are going to run on almost 50 per cent. less coal than is now used when the English engines, according to the above report, only make a saving of 10 per cent. And, more than this, it has been the experience of railroading that increasing the speed of a train increases the amount of coal used.

It seems like quite a blunder to talk about increasing the speed fifty per cent., and at the same time decreasing the amount of coal used per train mile, over forty per cent. by the introduction of above-mentioned single engines.

The suggestion of running fast and frequent trains at reduced fares by the use of these locomotives is beyond any reasonable consideration.

Suppose that the trains as now run were divided to make two instead of one, and these two trains were run twice as often as the one was before. There would be no more cars to be bought for the road, but the mileage of each one for the year would, of course, be double, and consequently the cost of repairs would be increased, and the life of the cars reduced one-half. Thus in a given term of years the first cost, repairs, interest, etc., would be about doubled. Next the expense of paying employés on the cars would be at least sixty per cent. more for two short trains than for one of twice the length. Next the number of engines would have to be twice what it is at present, and the cost of each of these engines would be about the same as for the ordinary. The pay roll for employés on the engines would be increased one hundred per cent. Round-house capacities doubled, expenses for telegraphing or train dispatching service increased, and so on, more expenditure in almost all departments.

The cost of locomotive repairs, which is one of the largest bills, would be more than doubled, because the number of engines would be 100 per cent. more, and the repairs on an engine running 90 miles an hour would be much more extensive in a year's time than those required on one that was used more within the bounds of its capacity. Engine repairs amount on an average to five cents per mile run, and if the engine makes 50 or 60 per cent. more miles per year, of course this expense of repairs will be increased in like ratio, and the total number of years that the engine can be used reduced the same. Consequently with these items, and the cost of buying twice the number of locomotives in the first place, and the expense of replacing them 60 per cent. oftener than before makes the total cost for a given time about double what it now is. And all this extra expense throughout the departments simply to do the same amount of business that is done at present.

In view of above figures, we are not likely to have "frequent fast trains run at reduced fares" by the use of single engines.

W. H. WESTON.

BOSTON, Mass., April 16, 1891.

Krupp Tires do not Break.

Editor National Car and Locomotive Builder:

I notice in the last number of the NATIONAL CAR AND LOCOMOTIVE BUILDER an article credited to "Niles Paper," as follows:

"A tire on one of the drivers of Michigan Central engine No. 219 broke last night, and the engine is laid up for repairs in consequence. This is the third engine to be similarly disabled within a month, and the circumstance is remarkable. The tires are made of the best steel, and usually run for years, or until worn out. The Central imports all it uses from the famous Krupp Steel Works in Germany."—*Niles Paper.*

I cannot imagine why the "Niles Paper" should publish such an article, or where they obtained the information that the tires referred to were Krupp tires, but in justice to the Krupp people I would state that the broken tire was not of Krupp's make, and while we do not use the Krupp tire exclusively, we have in use a great many of them, and we have yet to have the first one break. On the contrary, the Krupp tires that we have in use have proved in every way satisfactory.

C. E. SMART, General Master Mechanic.

MICHIGAN CENTRAL RAILROAD COMPANY,
General Master Mechanic's Office,
JACKSON, Mich., April 8, 1891.

A Cheap Fuel Gas.

Editor National Car and Locomotive Builder:

In perusing the February number of your journal, I read with interest an article on "Gas Fuel Fallacies," and I had intended ere this to have called your attention to what I think is an error in estimating the values of different fuel gases which are in use at this time. I wish to speak of a gas, or, perhaps, more properly speaking, carburetted air, by a process known as the Bury & Bidleman patents, which is, in my judgment, fully the equal, and I think more so, than of which you speak of as made in nature's producer; and, while it is not a competitor in price, it, I think, comes nearer to it than any other process.

The production of this gas is of the simplest character, being nothing more than air at from four to six pounds pressure forced through several cylinders, containing in each one several gallons of crude oil, or, better still, crude Ohio distillate. This air, after passing through these cylinders, is ready for immediate use. There is a plant in this town, owned by the Petroleum Light and Heat Company, who convey this gas for illumination through one-half mile of pipe, and I presume to say no better light of that nature has been produced by the systems mentioned in your article referred to above; and, as to cost of production, it is beyond doubt a competitor of any. At the request of this company I have experimented in the welding together of iron, also iron to steel, and I have found nothing more pure for that purpose, as there seems to be no elements in its composition to hinder the amalgamation of these metals. I am not writing this at the instigation of this company, but merely to express my opinion as to what I stated above, an error of classification.

ADRIAN, Mich., April 27, 1891. CHARLES R. TUNKS.

Washing out Boilers.

Editor National Car and Locomotive Builder:

Reading your editorial on washing out boilers in the April number of the CAR BUILDER inclines me to say a few words on the subject and give what little knowledge I am in possession of in regard to the abuses locomotive boilers are subject to when being washed out under ordinary conditions in some parts of this country. I have seen locomotives run into roundhouse with 140 lbs. of steam, fire knocked out, steam blowed off and water let out, and washed out, filled up with cold water and a big rousing fire put in and steam raised to 100 lbs. pressure in two and one half hours from time engine was taken into house. On same road I have seen engine after engine taken into

shops on account of broken staybolts, and from 10 to 65 found to be broken. One engineer came in with boiler-head protruding out like the hump on a camel, and brought in a full train too, with 140 lbs. of steam. More sand than sense!

Now, then, what brings about this state of affairs? The men in charge of roundhouses are well posted and know the proper way to wash out boilers, but will not attend to it. Business is rushing and the company is short of motive power, and an engine comes in and wants washing out. The transportation officers want to get a train out as soon as possible, and they keep hurrying up the foreman for an engine. He goes through this hurly-burly process to get engine out as soon as possible regardless of damage that is done to boiler and the risk he is incurring to human life. Now, this way is practiced on a good many roads continually, where proper time can be taken, for the simple reason they get into the habit of it and continue to keep it up, and never think of the injury that is being done to boiler. This practice should be stopped, for the penalty for the abuse of nature has to be paid sooner or later. If the companies are short of motive power and desire engines to be washed out in such haste, they should provide appliances to wash out with hot water and fill boiler with hot water, and then the danger of breaking stays from contraction and expansion will be reduced to a minimum. The old adage "A stitch in time saves nine" is a good rule to go by in the machinery department of a railway.

I. F. WALLACE.

License v. Seniority.

PITTSBURGH, April 16, 1891.

Editor National Car and Locomotive Builder:

Referring to communication in February number "License v. Seniority," will say that I am not in favor of employés being advanced simply on account of length of service, unless they are capable also. A man may fill a certain position, yet not be qualified for a more important one, although seemingly entitled on account of seniority; such cases often happen. To advance such a man would not be to the interests of his employers, and among engineers, generally, I do not believe such a course is pursued. It should be demonstrated that a man is not competent, however, before he is passed by. A man might pass a splendid examination before your license board, and then go out on the road and make a fatal mistake.

Unfortunately the class of mistakes usually made by engineers and conductors are not of the sort that could have been prevented by answering a number of questions and by paying a fee. Many of the mishaps in railroading happen outside the line of duty of engineer or conductor, and successful railroading requires the intelligent performance of duty by track man and switch tender, no less than by engineer and conductor.

A little more care on the part of railway officers in selecting for the service the most intelligent, educated and respectable men available would do much for the advancement of the employer's interests and that of the public generally. Railway officers frequently are quite indifferent regarding the sort of men they employ, provided the men come up to a certain standard physically. If the best possible men are selected to begin with, and intelligence and ability, coupled with length of service, made the basis for promotion, I believe all interests can be well served and we can struggle along without licensing all engineers and conductors, until the necessity for it becomes more evident than at present.

J. J. C.

Block Signaling.

In a paper read at the New York Railroad Club Mr. G. H. Paine said that the art of block signaling should be regarded by all railroad officers as of the greatest interest and importance. The domain of block signaling is now occupied by the permissive or time-limit system and by the absolute or space limit. A time-limit block is operated on the theory that a train may safely pass a given point which a preceding train has cleared a certain number of minutes before. That this theory is fallacious a great many disembodied souls would be willing to testify. Although it is easy to make rules instructing trainmen and operators not to let trains approach closer than some time interval, it has been found impossible to prevent collisions by a time limit. Permissive blocking is not blocking at all. It leaves too much to the vigilance and care of enginemen, flagmen and others. Permissive blocking ought to be called pernicious blocking.

A space limit or absolute block system depends on keeping trains a certain distance apart. It has been proved over and over again that the more complete and absolute the block system, the cheaper in the long run is the cost of operation. The best form of signal is the semaphore, and it is coming more and more into general use; but there are certain kinds of block systems with which it cannot be used, because no ordinary electric-battery current is sufficiently powerful to raise and lower the arm. Discussing the various forms of night signals the author said that the ideal semaphore would show at night a brilliantly illuminated arm the same size and shape as it appears in daylight.

There are very few railroads east of the Mississippi, north of the Ohio and south of the St. Lawrence latitude that could not establish and maintain at their stations block signals with little additional expense. Assuming that the speed of trains will average 20 miles an hour, block signals five miles apart will regulate the movement of 96 trains on a single track, 48 trains each way, not taking into account breakdowns or other causes of delay. When a free margin is given for delays the track will certainly handle half the number of trains without inconvenience. Where it is necessary to move a greater number of trains the block stations must be shortened. Using the ordinary stations as blocks requires nothing extra, but the telegraph operator and a two-arm semaphore connected with the telegraph office. The cost of operating such a system is very small.

When the business of a railroad is too large to be controlled by blocks located at the regular stations automatic blocks must be resorted to, which dispense with the use of signalmen.

The Hall system uses a red disk operated and controlled by an electric current. The circuit is controlled through relays operated by track instruments placed so as to be affected by the wheels of trains. These put the signal to danger when a train enters a block and return the signal to "clear" when the block is left.

The Union electric signal is operated by a track circuit, the ends of all adjacent rails in a block being electrically connected, and the different blocks insulated from each other. The signals are operated by a clockwork and electromagnet arrangement. When a train or other obstruction is on the block the circuits are automatically opened and the signals put to danger. When a train reaches a block where a danger signal is shown, the rule requires the engineer to stop for two minutes and then proceed with extreme caution. A danger signal at a block may mean several things. It usually means that a train is on the block, but it may mean that there is a broken rail, an open switch, and the system is a certain protection against these dangers.

The electro-pneumatic system has semaphores that are operated by compressed air, and require no attention beyond that given by the man in charge of the compressor. The valve controlling the compressed air into the signal cylinder is part of the armature of an electromagnet. This electromagnet is vitalized by a local circuit controlled directly by the track circuit in the same manner as the Union Electric Signal. The system is positive and immediate in its action.

The author evidently considers the electro-pneumatic system of signaling the best that can be employed. When the mechanism is maintained in good order it is strictly reliable, and much cheaper to operate than a mechanical system, where the blocks have to be placed within a mile or less of each other.

Lubrication.

At the last meeting of the Northwestern Railroad Club Mr. Charles Hertry read a paper on lubrication. The following are the parts of the paper of most interest to railroad men:

All men are wrong about something. A few have found out that the coal they burn at one end of their plant, and the power they get at the other depend on the oil they use between; the rest treat oil as a trifle. It is a trifle as to its cost, but is not a trifle as to consequences. We say to ourselves that oil is oil, and we will use the one that makes he least oil bill. The conclusion is right, but the reason is wrong. The oil that makes the least oil bill is the one to use, but that may be an accident. The reason for using it is that it lubricates most. The reason for using oil at all is to lubricate. Therefore use the oil that lubricates most.

Consider what lubrication is for—to save power in machinery. If the cost of oil were one hundred times more, we would use it; but we would also study it. Even then the true question would be, not what oil costs least, but what saves most of power and machinery. The magnitude of the lost work in machinery or shopwork is variable, it is always large. It may probably be fairly estimated that one-half the power expended in the average case, whether in mill or shop, is wasted in lost work, being consumed in overcoming the friction of surfaces. The rubbing real value of a lubricant is generally measured by its power of reducing friction. The real value of a lubricant to the user usually depends, not upon the relative friction-reducing power and endurance, as usually assumed, but upon the value of power saved by its use. The difference in value of good oil, and the enormous wastes of power, and of other costs, with ungents of poor quality is easily exhibited. The use of good oil instead of bad may enable an engine to haul two or three additional cars in a train, or a shop to be driven easily and economically, when otherwise it could not be driven, if at all, by an engine of proper proportion except very wastefully.

Coal and oil join hands with each other. Mechanics make it a constant study to make combustion perfect. They make the same effort to perfect appliances to save oil, and even then they are handicapped with even the best apparatus on account of a lubricant unfit for use. The oil that is successfully used on driving and truck boxes is not suitable for the link motion, especially in cold weather. A spindle works best in a bath of light oil. A dynamo wants a stream to more substantial oil. A cylinder takes a drop at a time of the heaviest oil. All through, from beginning to end, the bearings respond to oil that suits them. Machinery does most work when the oils are right in every part of them. Cylinder oil at the spindles would stop a cotton-mill. Too much cylinder oil is as bad as not enough. You question how much to use. That depends on the quality. The oil with the greatest natural viscosity should be used sparingly. A locomotive pulling a heavy freight or passenger train will certainly use more than when she is working light, depending somewhat upon the amount of condensation passing from the boiler to the cylinders. The engineer who tries to economize on cylinder oil has to try intelligently. Use as much oil as the engine needs, but no more. How much that is depends on the quality and the work the engine performs. If the cylinder oil is not vaporized through the high temperature at initial pressure it certainly cannot be done at the terminal; consequently, mixed with the condensation, it forms a pasty matter, filling up the cylinder cocks and leaving a deposit which is of no benefit. In a recent analysis of such a case taken out of an engine we found that it contained 33 per cent. of oil, 2 per cent. of water and the balance inorganic matter.

Arbitration Committee Decisions.

A very unusual case came up for settlement by the Arbitration Committee. A car belonging to the Chicago, Burlington & Northern was damaged by fire while on a siding on the Des Moines Union Railway. The latter company claimed that it was not responsible for the damage done to the car, and appealed to the Arbitration Committee, which settled that it was responsible for returning the car in good order. After this decision was made the car was repaired and returned to the owners, but the delay was so great that the car was held 309 days over the 60 days time allowed for the return of a car which has been held for repairs. The owners of the car made out a bill for $75.39 for the mileage lost by the car, and asked the Des Moines Union Railway to pay it. The company declined to do so, and this was referred to the Arbitration Committee.

The decision rendered was that the car ought to have been returned within 60 days under the Rules of Interchange. But as no penalties are prescribed for violation of this rule they could not undertake to decide what was a just settlement. We think it would only be just to amend the rule prescribing a penalty for keeping cars beyond the legal period.

The Cincinnati, New Orleans & Texas delivered to the Mobile & Ohio a foreign car carded for odd oil boxes. The Mobile & Ohio replaced the proper oil boxes and charged the carding road with the expense. The C., N. O. & T. P. declined payment on the ground that the car was safe to run, and that under Rule 6 the Mobile & Ohio had no right to execute the repairs.

The Arbitration Committee sustained the objection. Cases analogous to this have several times been before the Arbitration Committee, and it is about time that master car builders knew that they had no right to repair a carded foreign car that was safe to run.

The Ontario & Western rendered a bill against the Lehigh Valley for repairs to a card one side of which read "one door gone," while on the other side was marked "One door gone, one sill damaged, floor damaged, end damaged, damaged draw-timber." The bill was made out for the whole of the repairs. The Lehigh Valley people declined to pay for more than one door, holding that to be the extent of the card as given by their inspector. It was alleged to be a case of "raising the card." The Ontario & Western went into details to show that the handwriting was the same, although the additions were not on the inside of the card.

The Arbitration Committee protested against being called upon to decide a question of veracity, but they decided that the carding company could be held responsible only for the repairs called for by both sides of the card.

The Chesapeake & Ohio fell short on a technicality in a claim against the Cincinnati, Sandusky & Cleveland. The latter road delivered a foreign car to the Chesapeake & Ohio, which required repairs. The inspector belonging to the Cincinnati, Sandusky & Cleveland was absent when the car was ready for delivery, and to prevent delay an inspector belonging to the Columbus & Hocking Valley road put a card on the car, but erased the name of his own road and wrote on that of the Cincinnati, Sandusky & Cleveland, which was responsible. When the bill for repairs was sent to the Cincinnati, Sandusky & Cleveland that company's officers repudiated the claim on the ground that the card was not applied according to the M. C. B. rules.

On the question being referred to the Arbitration Committee, it was decided that the Cincinnati, Sandusky & Cleveland was not responsible for repairs done under an irregular card.

The San Antonio & Arkansas Pass rendered a bill of $5.79 against the Texas & Pacific for replacing one broken draft timber on a car carded by the latter road. The Texas & Pacific objected to the bill as being an excessive charge for labor and the other road held that it was the actual expense incurred,

On the matter being referred to the Arbitration Committee, the decision rendered was that the roads must come to an agreement based on the charge of 20 cents per hour allowed by Rule 26.

The Boston & Albany rendered bills covering the last four years against the Kansas City Dressed Beef Line for repairs to cars done under the provisions of Rule 10, which permits railroad companies to repair private cars and add 10 per cent. to the bills as figured under Rule 26. The Kansas City Dressed Beef Line objected to paying the bills and the case was referred to the Atbitration Committee. The decision was that the bills had to be paid.

A car belonging to the Fitchburg was burned on the New York & New England. It was a car that had been built in 1879, but in 1889 it had received extensive repairs that cost $78.30. The owners made a claim for the cost of the car, less the annual depreciation allowed under the rules since the car was thoroughly repaired. The company responsible for the destruction of the car held that the value of the car should be reckoned from the time it was built less the annual allowance for depreciation. Case referred.

Arbitration committee held that the depreciation should be figured from the time a car is built or completely rebuilt, and the decision was that the bill was not correct.

The Omaha & St. Louis rendered a bill against the Armour-Cudahy Refrigerator Line for repairs done to cars, 10 per cent. being added to the bill as provided for in Rule 10. The owners of the cars objected to the extra 10 per cent. on the ground that their repairs are done by the Chicago, Milwaukee & St. Paul Railroad. Correspondence with Mr. J. N. Barr brought out a corroboration of the information that the Chicago, Milwaukee & St. Paul repaired the cars in question.

The Arbitration Committee on being appealed to intimated that they had found by Sechrist's Guide that bills for repairs of the Armour cars are to be sent to the Chicago, Milwaukee & St. Paul Railroad, and therefore they do not consider that Rule 10 is intended to apply to these cars. The decision is that that the bill rendered is not correct.

This is a case where we dissent from the decision of the Arbitration Committee. We do not believe that Rule 10 should be relaxed, unless for cars that bear the name of a railroad company. Mr. Armour, owner of the cars, is a director of the Chicago, Milwaukee & St. Paul, and he ought to have his cars marked with the name of the road if he wants them to be exempt from the rules framed for the repair of private cars.

The Pittsburgh & Lake Erie had some cars destroyed in a wreck on the Erie, and one of them had a coke rack valued at $28, which was added to the charge for the car. The Erie objected, holding that they were not responsible for extra attachments to a car.

On the case coming before the Arbitration Committee, it was decided that under the present rules of interchange the Erie was not responsible for the coke rack.

A case, substantially the same as the last one, arose on a claim made by the Cincinnati, New Orleans & Texas Pacific for the value of a fruit car that had been destroyed by the Richmond & Danville, and which was valued at $300. The latter company held that the claim was excessive, and that the correct rating was $275. The owners insisted that the car had expensive ventilating appliances that raised the cost more than $25 in excess of the ordinary box car.

The Arbitration Committee decided that the company destroying the car were not responsible for the value of the extra attachments, and that the charge could only be made for a common box car.

The D. A. Hopkins Mfg. Co. give notice that they will remove their office May 1 to Central Building, Liberty and West streets, New York.

The Boyden Brake Company have published a new illustrated catalogue of their automatic quick-action air-brake system. Excellent woodcuts of all the principal parts of the brake are shown, and clear descriptive letter-type accompanies them, which make the catalogue a convenient instruction book. All persons that have anything to do with this brake ought to have the catalogue as a handbook. It can be obtained on application to the company, Baltimore, Md.

Pedrick & Ayer, of Philadelphia, the well-known makers of special tools for railroad work, have issued a new illustrated catalogue showing a great variety of the useful appliances they manufacture. The work is got out in first-class style and does as near justice as good art can to show the attractive features of machinery. This catalogue will be found a useful reference for all persons having anything to do with the selection of machinery for repairs of railroad rolling stock.

Boiler Construction.

At the March meeting of the Western Railway Club, Mr. John Hickey, superintendent of the Northern Pacific, read a paper on "Improvements in Locomotive Boiler Construction." After some preliminary remarks on the necessity for practical information concerning the construction, care and management of locomotive boilers, he took up the question of

MATERIAL.

Under this head the well-known objections to iron as a material for locomotive boilers were discussed in all their bearings. The objections were recorded as sufficient to preclude the use of iron in the construction of modern locomotive boilers. The only resort then was to steel plate, which, owing to the process employed in production, is immensely superior to iron as a material for boilers carrying high-pressure steam. A highly valuable characteristic of steel over iron for boiler plate is its homogeneity. The absence of seams, means in this case freedom from any tendency to laminate aud blister defects that generally shorten the life of iron plates exposed to the heat of furnaces. Objections were raised to the use of steel plates possessing a tensile strength higher than 55,000 pounds for fire-boxes and 60,000 for shells. When steel stronger than that was used it implied the presence of too much of a hardening element which made the sheet brittle when subjected to service, as it was originally deficient in ductility. Steel for boilers should have little phosphorus and no sulphur in its composition.

BOILER MAKING.

The resisting power of a boiler is measured by its weakest point. Poor workmanship, insufficient or improper bracing, may cause a weakness sufficient to endanger it, while other parts possess the qualities of high strength. The importance of improved design therefore, and the necessity of good workmanship, cannot be too strongly urged, and the existing and growing feeling for high boiler pressure is a factor absolutely requiring these.

The work of heating, flanging and annealing steel boiler plate prior to being used in construction, should only be performed by men who are fully skilled in the work. This branch of the business demands the highest intelligence and skill. The writer has seen steel plate of the finest quality, greatly reduced in strength and durability, by irregular heating and overheating, while being worked, and it was proved that any latter process of annealing was unable to renew the original features of the plate.

Machine riveting is much superior to that done by hand, as the powerful force of the machine upsets the rivet without injuring it, fills the hole perfectly, and introduces strength to the seam by the friction of the surfaces which form the seam, and the writer has demonstrated by tests that it requires double the power to slip a machine-riveted seam prior to its shearing, than it does a seam riveted by hand, although the ultimate shearing stress of the seam is about equal in both cases. It may be assumed, therefore, that the present value of machine riveting lies rather in the increased security and stiffness obtained at regular working pressure, than in any actual raising of the breaking load.

In the boiler illustrated no great departure from design of recent construction is claimed. The drawing is appended simply for the purpose of calling attention to a few points that, without it, could not well be illustrated.

In the absence of crown bars, it will be noticed, a system of radial stays is introduced, thus increasing the water space, and adding materially to the heating efficiency of the crown sheet. With this method, the strength of the parts is not in the least reduced, but, rather, increased. The wagon top part of the boiler is extended for the purpose of placing the dome at a point where the interior of the boiler is accessible, and of obtaining the advantages of enlarging the steam space. The outer sheet of the fire-box is seamless from the point of its junction with the foundation bar on one side, to that on the other, thus doing away with the necessity of joints in the sheet. Its circular form is also a feature of strength. The inner sheet of the fire-box is also without longitudinal seams, except at the foundation bar, and is slightly crowned, for the double purpose of increasing its crushing resistance, and permitting, to some degree at least, a better line of connection for the radial stays between it and the shell.

In order to support the boiler head, it is customary in some quarters to introduce stay rods making a diagonal connection between the head and shell, instead of the long rods usually placed to brace the boiler head and front tube sheet. The principal objection to the diagonal supports is the additional holes in the shell which must be placed there for their attachment, and which, together with the holes created for the radial stays, fritters and reduces the strength of the shell at that point. The longitudinal tie rods connecting the boiler head and front tube sheet are quite as effective and less expensive.

The plate on which is located the dome is 9-16 inch thick all the others being but ½ inch, the throat sheet alone being in thickness ⅝ of an inch.

In connection with the boiler sheet being flanged upward for the dome attachment, a sustaining ring about ⅞ in. × 4 in. is fitted at the base for the purpose of adding to the sustaining qualities of the boiler at this point.

For years we have been troubled with leaky corners at the foundation ring in fire-boxes. In recently constructed boilers, the end sheets of the fire-box have been extended a few inches at the base, for the purpose of carrying the joint beyond the corner, thus getting the same along the side a few inches from the latter, as shown on drawing. This plan of construction has wiped out entirely the evil of leaky corners.

To guard against the danger of a number of broken stay bolts in proximity to each other, a small hole is drilled into the outer end of each to the depth of one inch, and as the stay bolt breaks usually at a point near the outer sheet, the leak following the fracture of the bolt will at once locate the trouble.

TUBES.

The tubes are placed in vertical rows to promote a free circulation of water, and to permit the impurities to find their way more readily to the bottom of the boiler. Discussing the best character of tubes, Mr. Hickey favored the use of tubes 2¼ inches diameter. He considered that the enlarged size provided a tube that was not so easily to get choked with cinders as those of smaller diameter. He also promulgated a theory that the larger tube prolongs the action of combustion in the flame entering the tube, and that the high temperature will be conducted a longer distance inside.

DOMES.

The position was taken in the paper that a dome is an attachment of doubtful utility. The belief was expressed that a dome placed away from the heating surface supplied moist steam to the cylinders unless well protected by a non-conducting material, and that it was wise to make them no higher than absolutely necessary.

MUD DRUMS.

The use of mud drums was advocated, although it was admitted that they had been generally abandoned. Believed that a mud drum firmly made and placed in the underside of the barrel of the boiler would be a good investment, not only for removing deposits, but for the purpose of inspection.

SHALLOW FIRE-BOXES.

A decided stand was taken against the use of shallow fire-boxes. The surface of the fire in furnaces so constructed must necessarily be near the level of the tubes, and it was contended that sufficient time is not given for combustion unless a combustion chamber be employed. A call was made for those favoring shallow fire-boxes to justify this mode of construction.

TESTING.

Until a boiler is properly tested, there is always an element of doubt as to its actual strength. Periodical testing of boilers should never be overlooked. The date of such tests, the pressure exerted, and any incidents of importance connected therewith should be matters of record, and ready to be referred to any time. It is generally supposed that a hydraulic pressure approaching the point of the ultimate strength of the boiler is the proper testing strain. Under ordinary conditions it is not the bursting strain of the boiler that is sought to be obtained. A test pressure 33 per cent. in excess of the service pressure and maintained for some time will enable the inspector (who should take measurements before, during the pressure and after) to observe any extensions, distortions, or bulging, etc. Should no irregularities be noticed under these conditions, the boiler is safe—if not abused in other directions—for a reasonable length of time, or until the next

test is in order. I have personal knowledge of many boilers being ruined by the strain of reckless pressure in testing.

CARE OF BOILERS.

Under this heading the destructive agencies put upon boilers by those in charge, were discussed. The principal causes that lead to the premature weakening of boilers are: The practice of washing out with cold water when the plates are hot, impeded circulation caused by accumulation of incrustation or restricted water passages, forcing cold air over the heating surfaces when raising steam hurriedly or in drawing the fire, and low water due to carelessness in feeding. The results that flow from these causes are expensive and disastrous.

Graduates of Stephens' Institute Now Railroad Men.

In view of the movement by the Railway Master Mechanics' Association to establish scholarships for the sons of members in an engineering college, it will be of interest to our readers to learn the names of the graduates of one technical school who have followed railroad business. Through the kindness of Professor Morton, of the Stephens' Institute of Technology, Hoboken, N. J., we have received the following list of graduates of that institution who are now railroad men:

BUSH, PRESCOTT, M. E., '84—New Jersey.—*Thesis:* Dynamometers (Experimental Investigation).—*Location:* Ass't Eng'r, Motive Power Dep't P. C. & St. L. Railway, Columbus, O.

ANTZ, OSCAR, M. E., '78—New Jersey.—*Thesis:* Design for a Ten-horse Power Steam Engine—*Location:* Ass't Master Mechanic, "Meadows" shop, Pa. R. R., Jersey City, N. J. Was appointed Master of Mechanics of Savannah shops of the Central R. R. & Banking Co., of Georgia, Savannah, Ga., to succeed F. H. McGee, transferred.—Dec. 1, 1890.

BENSEL, JOHN A., M. E., '84—New York.—*Thesis:* Dynamometers (Experimental Investigation).—*Location:* Ass't Eng'r, Maintenance of Way Dept., Penn. R. R., Jersey City, N. J. Read a paper on "The New Transfer Bridge, Hassimus Cove, Jersey City, N. J., at the meeting of the Amer. Soc. Civ. Eng'rs, Oct. 3, 1888. Is a junior member of the Am. Soc. Civ. Eng'rs.

BRUCK, HENRY T., M. E., '78—New Jersey. *Thesis:* Design for a Jonval Turbine.—*Location:* Master of Mach., Cumberland & Pa. R. R., Mt. Savage, Md. Is a member of the Amer. Soc. Mech. Eng'rs and of the Railway Master Mechanics' Association.

CAMPBELL, GORDON, M. E., '88—New York,—*Thesis:* Electric Motors.—*Location:* Draughtsman, Union Pac. R. R. Denver, Col.

CAMPBELL, NORMAN ST. G., M. E., "88—New Jersey.—*Thesis:* On the Construction of a Locomotive.—*Location*: Baldwin Locomotive Works, Philadelphia, Pa.

DEMAREST, THOMAS W., M. E., '88—New Jersey.—*Thesis*: Test of the Worthington High Duty Pump, Hackensack Water Works.—*Location*: Pan Handle R. R. Shops, Columbus, O.

ESTRADA, E. DUQUE, M. E., '83—Cuba.—*Thesis*: The Cuban Woods Useful in Engineerring. (An Experimental Investigation). *Location*: Assistant Engineer's Office. P. C. & St. L. Railway, Pittsbugh, Pa.

FERRIS, HARRY C., M. E., '88—Ohio.—*Thesis:* Review of the Manufacture of Cellulose for a Fiber in Paper-making.—*Location:* Assistant Engineer, Toledo, Columbus & Cincinnati R. R., Toledo, O.

GIBBS, ALFRED W., M. E., '78—New Jersey.—*Thesis:* The Machiney of Swift Steam Launches.—*Location:* Appointed Supt. of Motive Power, Central R. R. and Banking Co. of Georgia, Savannah, Ga., Dec. 1, 1890. Member Railway Master Mechanics' Association, and of American Society of Mechanical Engineers.

GIBBS, GEORGE, M. E., '82—New York.—*Thesis:* Electrical Transmission of Power.—*Location:* Mechanical Eng'r, Chicago, Mil. & St. Paul Railway, West Milwaukee, Wis. Is a member of the Amer. Soc. Mech. Engineers and of the American Railway Master Mechanics' Association.

GRISWOLD, HOWARD C., M. E., '88—Kentucky.—*Thesis:* Temperature of Wires Carrying Electric Currents.—*Location:* Louisville & Nashville R. R., Louisville, Ky.

HEISKELL, JOHN M., M. E., '86—Tennessee.—*Thesis:* Review of the Mechanism of the Equitable Building, New York City, including Boilers, Engines, Heaters, Electric Lighting, etc.—*Location:* Office of Resident Engineer, Kansas City and Memphis Railway, Memphis, Tenn.

LORD, EDMUND P., M. E., '82—Mass.—(Ph. B., Sheffield Sci. School.)—*Location:* Ass't Superintendent of Motive Power of the Pennsylvania Lines West of Pittburgh at Fort Wayne, Ind.

ONDERDONK, JOHN R., JR., M. E., '89—New York.—*Thesis:* Elocrtical Properties of German Silver.—*Location:* Draughtsman, Mt. Clair Shops, B. & O. R. R. Co., Mt. Clare, Md. Mr. Onderdonk has patented a car coupler of simple construction.

MILLER, SAM'L W., M. E., '87—New York.—*Thesis:* Test of Steam Plant of N. Y. Cotton Exchange.—*Location:* P. C. & St. L. Ry., Dennison, Ohio.

RANDOLPH, L. STROTHER, M. E., '83—Maryland.—*Thesis:* Resistance of Railway Trains.—*Location:* Engineer of Tests, Balt. & O. R. R., Mt. Clare, Baltimore, Md. Was formerly with N. Y., L. E. & W. R. R., at Susquehanna, Pa., then master mech., Florida Ry. & Nav. Co., Fernandina, Fla., and is now located as above; member of the American Railway Master Mechanics' Association.

SAGUE, JAMES E., M. E., '83—New York.—*Thesis:* Construction and Performance, as Determined by Trial, of the Steamer "City of Fall River". (*Amer. Engineer*, 1883; *Jour. Frank Inst.*, 1884).—*Location:* Master Mechanic, E. R. R., Rochester, N. Y.; is now Engineer for West India Improvement Company, and is Supt. of Railroads on Island of Jamaica. Has been in Dept. of Tests of Burlington & Quincy R. R., Aurora, Ill.; then Engineer of Tests, N. Y., L. E. & W. R. R., E. Buffalo, N. Y., and then at Rochester, as given above. Has been a member of the Amer. Soc. of Mech. Engrs. since Nov., 1887. Member of the American Railway Master Mechanics' Association. Has written an article on "Design of Locomotive and Car Springs" for Stevens Indicator, Jan., 1889.

SLACK, JOHN R., M. E., '86—New York.—(A. B., Columbia College).—*Thesis:* Discussion of Cut-off Valve Gears for the Corliss Engines.—*Location:* N. Y., W. S. & B. R. R, Frankfort, N. Y.

STEWARD, JOSEPH E., M. E., '83—New Jersey.—*Thesis:* An Experimental Determination of the Efficiency of the Otto Gas Engine.—*Location:* Ass't Mast. Mech., P. Ft. W. & C. R. R., Fort Wayne, Ind. Has been located with Chic., St. L. & Pittsburgh Div., Pa. R. R., at Logansport, Ind., then with P. C. & St. L. R. R., at Dennison, O., and now as above.

STEVENS, WM., N. M. E., '85—New Jersey.—*Thesis:* Leading Points in Locomotive Construction and Performance.—*Location:* Office of Eng'r of Bridges and Buildings, N. Y., L. E. & W. R. R., New York City.

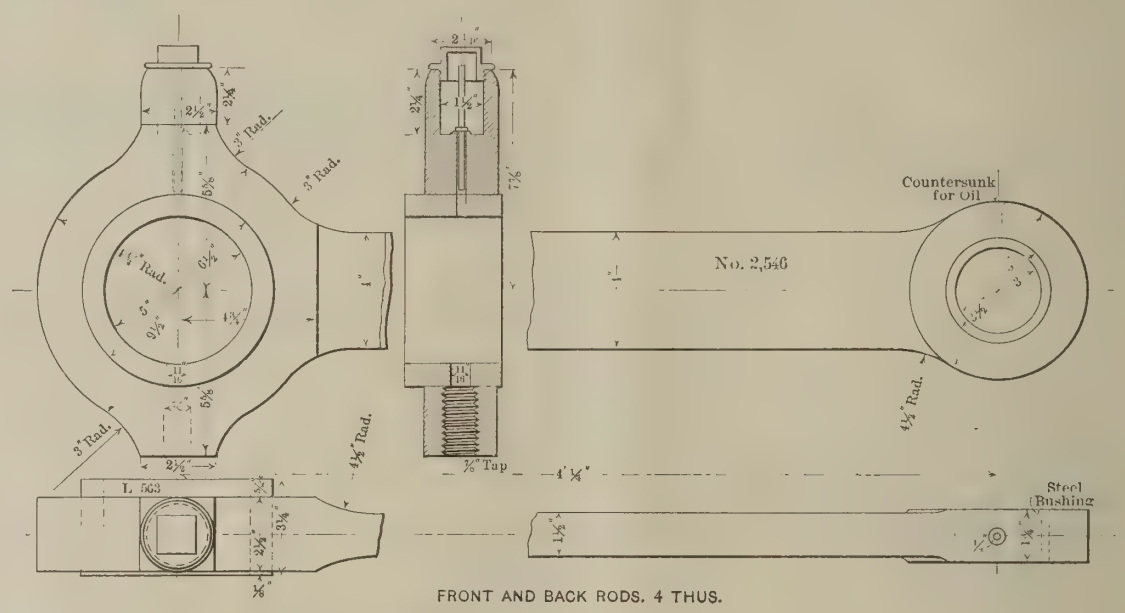
WALL, EDWARD B., M. E., '76—New Jersey.—*Thesis:* The Principles of Car Framing.—*Location:* Sup't Motive Power, Pittsburgh, Cin. & St. L. R. R., Columbus O. Formerly in car shops, Pa. R. R., Altoona, Pa., then Asst. M. M., C. C. & I. C. C. shop, Columbus, O., and now as above. Member Railway Master Mechanics' Association and of American Society of Mech. Engineers.

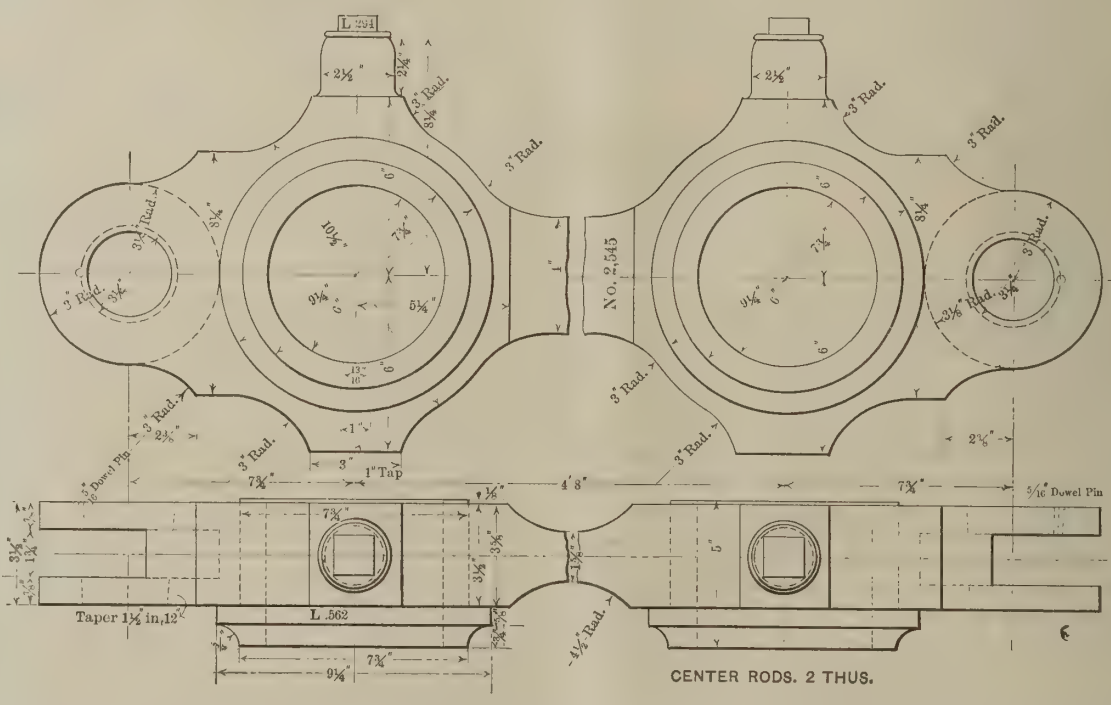
WALLIS, J. MATHER, M. E., '76—Louisiana.—*Thesis:* The American Beam Engine.—*Location:* Sup't Motive Power, Baltimore & Potomac R. R., Baltimore, Md. Now at Altoona, Pa.

WALLIS, PHILIP, M. E., '79—Louisiana.—*Thesis:* Review of the Engines of the Steamer "Mary Powell."—*Location:* Master Mechanic Norfolk & Western R. R., Roanoke, Va. Member American Railway Master Mechanics' Association and of the American Society of Mechanical Engineers.

Forged Oil Cups.

A costly item in the maintainace of locomotives is the replacing of rod oil cups. In nearly all American locomotives brass cups are used that are screwed into the rod and they are very difficult to keep in their place, the consequence being that the right of way of many railroads is strewn with brass oil cups that have worked loose. There is a serious direct loss from this cause, and trains are frequently delayed owing to hot pins that result from the loss of the oil cups. To effectually remedy this evil, some master mechanics have lately specified for the forging of oil cups on the rods, a practice that is almost universal on European railroads. Most of the rods we have examined in this country with forged oil cups have been made in a way that is very difficult to finish. A decided exception to this are rods made by Mr. James M. Boon, of the West Shore Railroad, and illustrated in the annexed engraving. The part forming the cup is a rounded top which is finished in the boring mill at very small cost. The rest of the rod is then finished in the usual manner. This plan of construction is now adopted for all new side rods and main rods, and is well worthy of imitation.





In the West Shore shops at Frankfort, N. Y., they use a boring mill for turning up piston rings. It does the work very expeditiously.

A superintendent of motive power who is neutral on the car coupler question, speaking lately of breakages of the vertical plane type on his road said: "The wonder is that some of the couplers ever get out of the yard; they are made so weak, that a good kicking mule would smash them into cupola scrap.

The life of an ordinary roof or outside paint runs all the way from two to five years, and it should be of personal interest to many to know of a paint that will resist acids or alkalies and withstand the wear and tear of the elements for 10 or 15 years. This seems to be a remarkable length of time, but the statement is vouched for by well-known people who have used Dixon's Graphite Paint made by the Jos. Dixon Crucible Company, of Jersey City, N. J.

The Magnolia-Anti Friction Metal Company, has received in the last few days, from London, copy of a diploma for gold medal, awarded to them by the International Electrical Exhibition, held at Edinbugh, Scotland, in the last part of 1890. This medal was awarded for a special anti-friction metal for bearings of dynamos and other high-speed machinery. The Magnolia Anti-Friction Metal Company, has also received fac-simile of a beautiful gold medal given it by the Edinburgh Exposition.

The Butler Drawbar Attachment Company give notice that they are prepared to guarantee against breakage, within a period of one year from date of application, any of the Butler drawbar attachments furnished by or through this company. Upon receipt of such attachments, broken within the specified time, they will furnish free of charge new ones to replace them. Some of the castings furnished two or three years ago were probably too light; they, however, have strengthened all the parts and will now guarantee them against breakage.

On a visit to the E. D. Albro Company's great mills at Cincinnati it was evident that in the foreign woods mahogany takes the lead. Following this prima vera (white mahogany) is now in great favor among railway car builders, and for interior trim of fine dwellings. The Albro Company has just yarded a very choice cargo of prima vera logs of the west coast wood, Mexico, which is the kind most sought for. English brown oak is in demand for car finish. In domestic woods oak is the leading wood, and the demand for lumber and veneers so active that prices have materially advanced. This company is very busy and sales for 1891 show heavy increase over last year.

The Taylor Iron Works, of Highbridge, N. J., manufacturers of car wheels, etc., have removed their New York office to the Central Building, corner Liberty and West streets.

The Pittsburgh, Shenango & Lake Erie Ry. are having built by the Barney & Smith Manufacturing Company of Dayton, O., six first-class passenger coaches to improve their passenger service and have ordered their coaches equipped with the Scarritt high back seats and the equipment is said to be very [illegible]ant.

The annexed engraving illustrates the Cook patent automatic nut tapping machine, designed to automatically tap square or hexagon nuts. It consists of five distinct parts.

1st. The hopper or receptacle into which the blank nuts are thrown, and which discharges the nuts automatically into the straightening tube.

2d. The straightening tube, for bringing the nuts into position for the automatic feed mechanism, which holds and prevents them from turning while they are started on the tap, and the process of tapping finished; when they are dropped from the discharge spout into the receiving box.

3d. The chuck or mechanism for holding and revolving the tap, so designed as to permit the finished nuts to pass over and off the shank of the tap without removing or reversing it.

4th. The base of the machine, which contains the parts necessary to give movement to the feed and tap chuck.

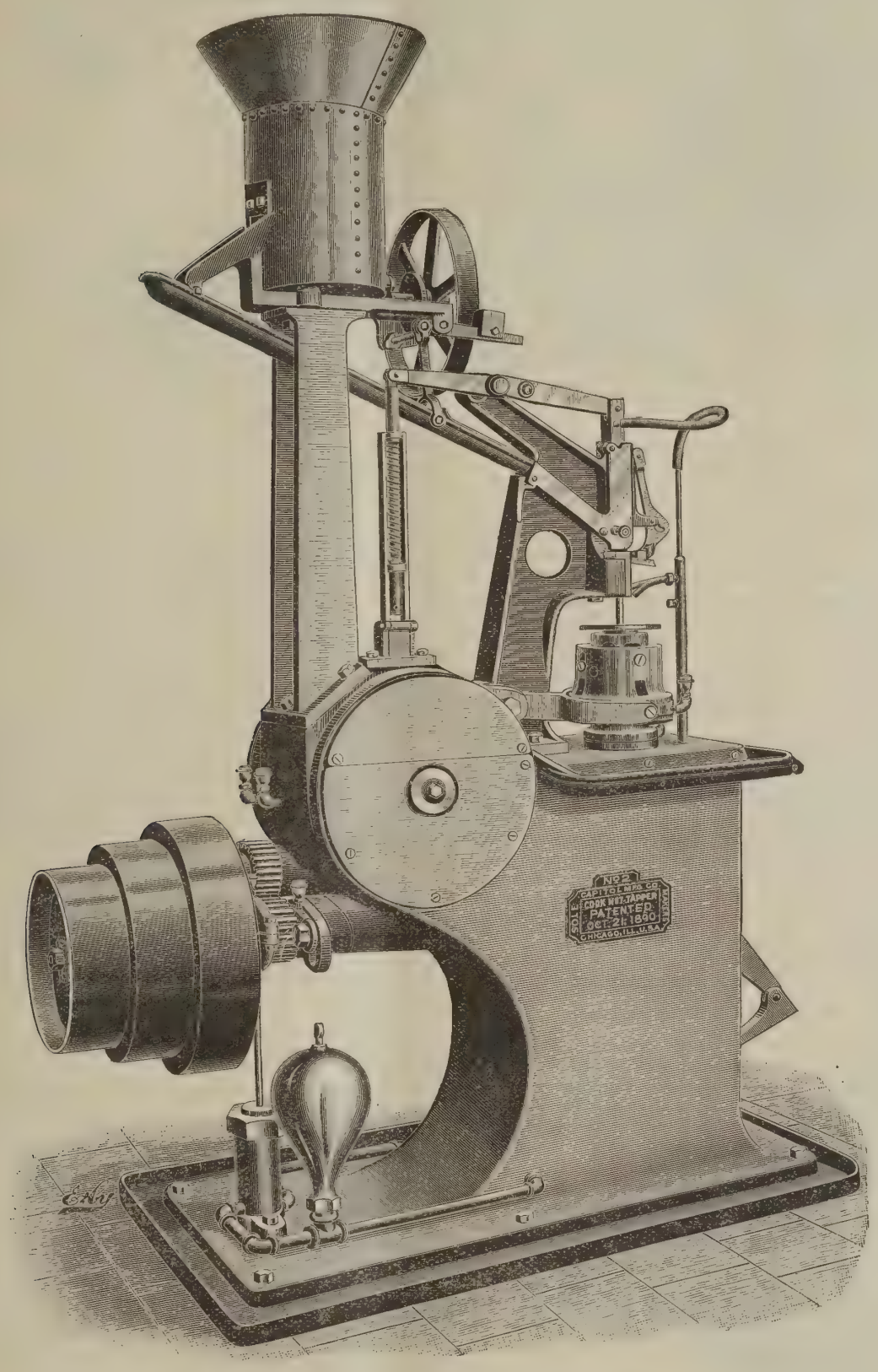
5th. The pump which supplies the machine with the necessary lubricant for tapping and cooling the tap. This lubricant passes through separating pans, and after being strained of all chips and foreign matter, is used over again without unnecessary waste.

The machine is made in four sizes, capable of threading nuts from the smallest to nuts with 1½-inch hole. The range of the machines can be changed to suit requirements.

These machines are manufactured with one, two or three chucks or taps. It requires no attention except the filling of the hopper with nuts, and grinding the taps, when they become dull. The taps being kept perfectly cool by the company's lubricating system last longer than in ordinary nut tappers. Machines having but one chuck or tap have a greater capacity than any three of the five spindled machines on the market. One man can attend to ten or twelve of these machines without difficulty. The capacity of the machine varies according to size and quality of nuts to be tapped. Taking ⅛-inch square nuts for instance, one tap will thread from 20 to 30 per minute, the number depending somewhat upon the quality of the nuts. All operations are performed automatically, hence it is impossible to miss a nut. Each additional chuck or tap proportionately increases the capacity of the machine, without increasing the cost of labor. The limitation of the tapping capacity of the machine is determined by the strength of the tap.

The machine is very simple in construction, has no complicated adjustments, and is not subjected to excessive wear, as its construction prevents chips from getting into the working parts. The above machines have been thoroughly tested, have passed the experimental stages, and are now ready for the market.

The Capitol Manufacturing Company, Chicago, who are the sole manufacturers of the above, have one of the machines continuously at work at their shops. Parties interested in this class of machinery are invited to call and see it in operation.



COOK NUT TAPPING MACHINE.

The Eureka Tempered Copper Company, of North East, Pa., report an order for their pure tempered copper received during the last week from the Edison General Electric Company, amounting to over six tons of their metal.

The Laclede Car Works, of St. Louis, Mo., report business as excellent. Among their orders are 50 open cars for the West Chicago Street Railway, 74 for the Cincinnati Consolidated Street Railway, and a large number for railways in Montana.

The American Steel Wheel Company has established offices in this city for the conduct of its business, the experiments for some two years past with the new invention of solid steel castings for railway wheels having demonstrated the success of the principle in actual service. The company is but recently organized, and embraces railway men of great prominence and well-known capitalists. To railroad men and experts in metals the fact that huge castings of solid steel can now be made without flaws, blowholes or imperfect welds is a matter of great significance.

Van Noorden & Co.'s Ventilators.

We would call attention to the illustrations herewith of the Clover-Leaf Ventilator, made by E. Van Noorden & Co., 383 Harrison avenue, Boston. It is especially adapted for use by railroad shops, owing to its large ventilating area and its capacity for removing heat and steam. It depends for its efficiency upon external air currents. When the wind does not blow it does not work, but when the wind does blow it works with a great deal of force, and the slightest current of

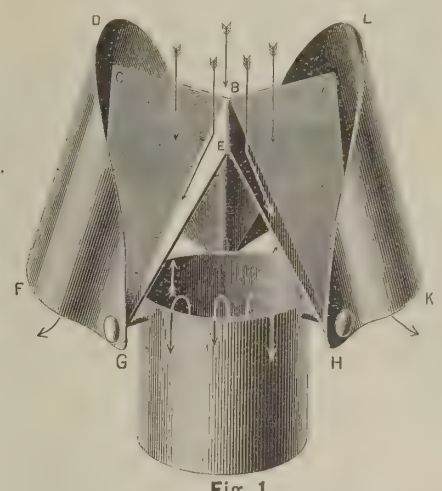


Fig. 1.

wind is sufficient to set it in motion. Fig. 1 shows a sectional view, with one of the parts removed so as to better show the construction. It consists of a round shaft having a three-gabled roof, *B E*, and three shields, *D F G* and *L K H* (one being omitted), which correspond with the openings in the gables. The upper line of arrows indicates the downward wind striking the gabled roof, slanting off each side, and pulling up foul air, heat, steam, etc., from the interior, as shown by bent arrows. When the wind blows horizontally it makes a suction in the shaft, and the inside air finds an exit through the spaces between the gables and the shields. The effect of this construction is to make it absolutely stormproof. No rain or snow can enter in the most severe storms. We would strongly recommend any railroad company having shops difficult to keep free of gas to try the effect of these ventilators. The same company also make a hollow-metal skylight of galvanized iron, brass or copper. Galvanized iron is the material mostly used, on account of its comparative

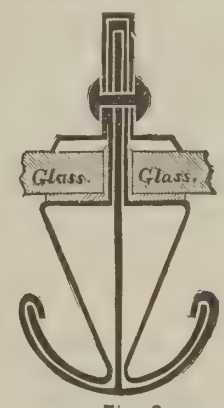


Fig. 2.

cheapness. Fig. 2 shows a section through one of the skylight bars, showing the rabbets on which the glass rests, the condensation gutter, and the cap on top of the glass. The glass used is generally one-quarter inch thick, and in lights six or seven feet long and about 18 inches wide. In paper-mills, the heat and steam from the engine-rooms, striking the cold surface of the glass, form large volumes of condensed moisture, which, if not provided for, drips down into the room and is a serious annoyance. This is entirely obviated by the condensation gutters on the skylight bars, which catch all such condensation and carry it out onto the roof. These hollow-metal skylights are very light in weight, very strong, and owing to the small amount of material in the bars they do not expand or contract. In this way the breakage of glass is avoided, making a marked point of superiority over wrought-iron skylights, which are at once costly, heavy and inefficient. The hollow-metal skylights are far superior to wood, as the latter will rot and leak and are not durable.

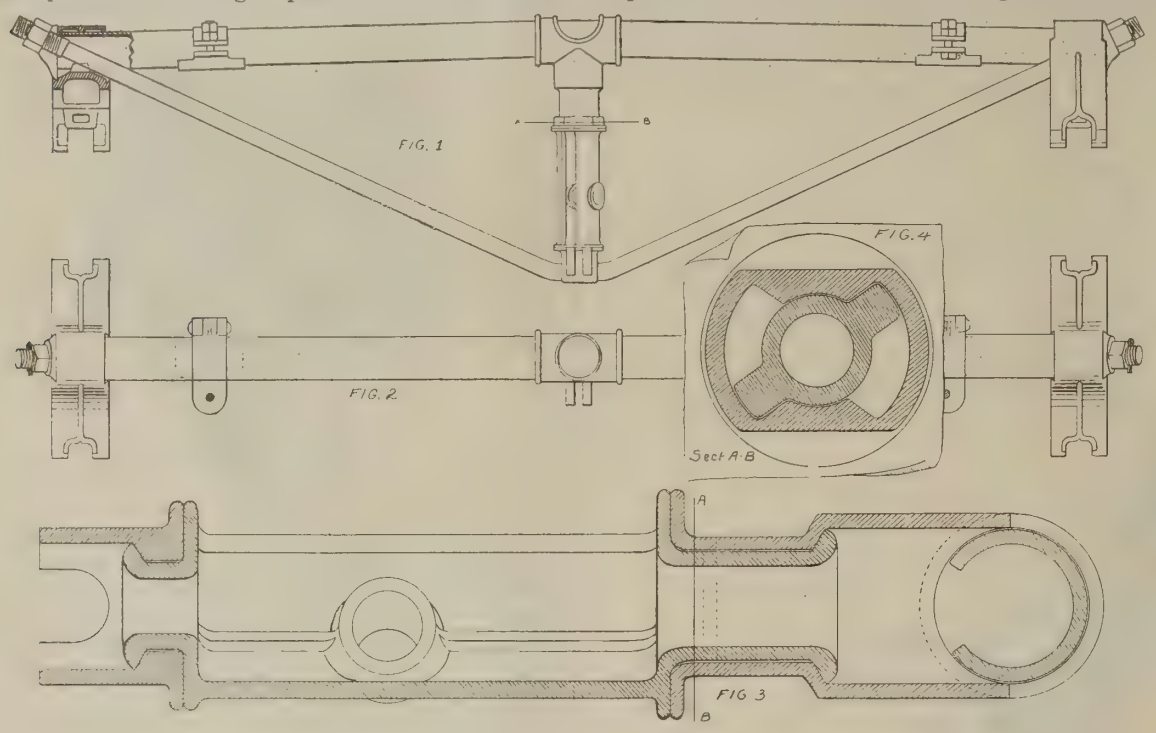
The Westinghouse Machine Company reports the appointment of a new General Agent, for the State of Durango, Mexico, in the person of Mr. T. F. Wetherbee, with headquarters at the City of Durango.

The office of the Consolidated Car Heating Company in Chicago will, after May 1, be at No. 200 Phenix Building, instead of No. 616. Railroad men are always welcomed at Room 200 to inspect the glass and other models of the heating devices of the Consolidated Company, which will be found on exhibition at the Chicago office.

The Gould Air Brake Company, of Buffalo, N. Y., was organized on the 8th instant. Charles A. Gould was elected president; Henry C. Gould, vice-president and treasurer; F.P. Huntly, secretary, and Edward R. Knowles and Earnst C. Webb, directors. The company, in addition to two or three patents owned by itself, has bought the exclusive right to manufacture and sell under the patents of the United States Air Brake Company, of New York City. The brake which it is proposed to manufacture has been in service for over a year on the New York, Susquehanna & Western. The connections are interchangeable with the Westinghouse air brakes. The company will also manufacture locomotive brakes and pumps. Sketches have been prepared for the company's buildings, but it has not yet been decided where they will be located.

The annexed illustrations show partly in section and partly outline the steel brake beam manufactured by the Universal Brake Beam Co., Chicago. The outward appearance of the beam can be readily understood from an examination of figures 1 and 2. Figure 3 is a longitudinal section through the strut or king post, and figure 4 is a cross-section of the same part through the point *A B*.

The advantages claimed for this form of brake beam are, that it produces the strongest possible form of a beam for



UNIVERSAL BRAKE BEAM.

the weight of metal employed, at the same time combining in an eminent degree the qualities of stiffness and elastic resilience.

The brake beam consists essentially of concavo-convex tension and compression members joined at the middle by a peculiar form of strut or reversible king-post, and at the ends by the brake-head boxes. By the peculiarities of constructive design the boxes in the brake head form complete housings for the terminals of the brake beam, the boxes preventing displacement in either direction of the members of the beam, and consequently making a particularly strong connection for shoe head and beam. The brake beam, although much stronger than others in common use, is much safer in case of accidental breaking of the beam hanger, for then the flanges of the beam which, although abundantly strong to withstand the brake strains, the light flanges readily crush under the wheels and the thin web conforms to the rail, preventing the wheels from jumping the track.

The king-post or strut, it will be noted, is shrunk on one member of the truss and bound securely by the rod at the other end, making a particularly substantial connection. The strut itself forms a reversible fulcrum for the brake lever, and it can be readily adjusted to lean the lever to either side, giving a right or left hand action, obviating the necessity for railroad companies keeping a mixed stock of brake beams on hand. The ends of the truss rods are securely fastened by strong nuts held from slacking by substantial keys.

The finished beam weighs for passenger cars 76 pounds and 72 pounds for freight cars. The main bar of the beam has a tensile strength of 65,000 pounds, and the tie rod stands from 55,000 to 60,000 pounds.

The following table of tests will give an idea of the comparative strength of the Universal brake beam:

COMPARISON OF BRAKE-BEAM TESTS MADE BY THE M. C. B. COMMITTEE, FOR STRENGTH, STIFFNESS AND ELASTIC RESILIENCE PER POUND OF METAL IN BEAM.

Name of beam.	Weight.	Load of 15,000 lbs. Deflection.	Load of 15,000 lbs. Set.	Ultimate strength.	Strength per lb. of iron.	Stiffness—load to deflect beam 0".01 per lb. of iron.	Elastic resilience in in.-lbs. per lb. iron.
National.....No. 1	46.5 lbs.	0".12	0".00	25,350	545	26.8	30.0
" ..... " 2	51.1 "	.115	.01	28.000	549	25.5	
" ..... " 3	64.1 "	.08	.00	35,500	555	29.2	
" ..... " 4	100.0 "	.055	.00	53,400	534	27.3	
" ..... " 5	99.5 "	.06	.00	47,500	480	25.2	
				Mean =	533	26.8	
P. R. R. (Westinghouse type), No. 1	80.0 "	.09	.01	37,300	466	20.8	21.1
" " " 2	72.5 "	.105	.01	34,000	469	19.6	
" " " 3	69.5 "	.105	.005	30,000	432	20.4	
" " " 4	68.0 "	.09	.00	36,200	532	24.4	
" " " 5	66.0 "	.09	.01	27,500	417	25.2	
				Mean =	463	22.1	
P.C.&St L." No. 1	64.0 "	.11	.00	27,000	422	21.3	18.9
Westinghouse, " 1	76.0 "	.105	.015	32,000	421	18.7	
" " 2	88.0 "	.06	.00	34,000	386	28.2	
" " 3	78.0 "	.09	.00	38,860	498	21.3	
" " 4	79.5 "	.06	.00	38,700	490	31.5	
				Mean =	449	25.0	
Central .....No. 1	69.0 "	.155	.025	31,500	456	14.0	13.3
" ..... " 2	79.0 "	.17	.01	23,000	291	11.2	
" ..... " 3	72.0 "	.155	.025	30,570	425	13 4	
" ..... " 4	88.0 "	.14	.02	36,000	409	12.2	
" ..... " 5	87.0 "	.155	.045	42,950	494	11.1	
				Mean =	415	12.4	

Tests made by Prof. J. B. Johnson at Washington University, St. Louis, Mo.

Universal.....No. 3	46.0 lbs.	0.127	.00	Above 30,000	Ab. 654	25.7	33.8
" " 4	46.0 "	0.133	.00	34,000	739	24.5	
				Mean =	Ab. 700	25.1	

Gold Car Heating.

The Gold Car Heating Company write us: The Delaware, Lackawanna & Western Railroad have, after a three-winters' practical use of our system of steam heating for passenger cars, decided to equip the whole of the remainder of their passenger rolling stock (upward of 300 cars), whether running in New York State or in States where the law does not compel them to use other means of heating than live fires in the stove. In connection with this it is practically proved that our storage heater system and Duplex double coil system work to great satisfaction together, that is, that a train may be composed of several cars, some equipped with one system and some with the other, and all cars are heated comfortably.

This order may be considered as one of the most important yet given out, representing a large road like the Lackawanna, and after such a thorough test on between 200 and 300 cars, as they have given our apparatus. The Boston & Maine Railroad have also given us an order for equipping a number of cars after having made a practical test on one car. We are also very busy equipping cars for and shipping material to the following roads: New York, Lake Erie & Western; New York, New Haven & Hartford; Chicago & Eastern Illinois; New York and Northern; Western New York & Pennsylvania; and have work going on at the following car shops: Pullman Palace Car Company, Gilbert Car Manufacturing Company, Barney & Smith Manufacturing Company, Wason Manufacturing Company, Laconia Car Company, Ohio Falls Car Company.

St. Louis Car Coupler Tests.

Tests were made on the Cairo Short Line at East St. Louis last month of the steel coupler made by the St. Louis Car Coupler Company. The coupler was placed on a refrigerator car, and a loaded heavy box-car having a plain drawbar was set out on a clear track and the refrigerator was pushed into it four separate times, the same as a running switch is made. The record of the tests was as follows:

First Test—The refrigerator was driven at the rate of five miles an hour, striking the box-car squarely. Result; a very heavy blow, timbers in the car started some; no apparent injury to either coupler.

Second Test—The refrigerator was driven against the stationary car at a speed of 15 miles. Result: The head of the old-style link and pin coupler was broken short off and thrown a distance of 20 feet; steel coupler in perfect condition, showing just a dent where the blow was given; end timbers of the cars driven in and displaced.

These tests were made with the knuckle in position, and the hammering was consequently all on the knuckle.

Third Test—The knuckle was removed and the refrigerator driven with the bare shank at the rate of 12 miles an hour against the standing car, in which another old-fashioned bar had been placed. Result: End timbers of car give way; the old-fashioned bar wedges itself in the jaws of the steel coupler and is held there; no breakage on either bar.

The steel coupler was finally broken by shifting out of position, owing to the shattered condition of the end timbers, and receiving a side blow on the tip of the casting, which knocked off a piece of the lip; no other damage was sustained.

Morton Car Heater System.

In the Morton safety heater system the heat taken from the locomotive is stored in an earthenware tube inclosed in an iron pipe. Steam is applied for five or ten minutes only, and sufficient heat is stored to keep the car comfortable for several hours. In winter, when at night the locomotive is detached and the car is left standing out of doors for ten or twelve hours without steam, the train will be from 35 degrees to 40 degrees next morning. Very satisfactory tests of this system were made on the Grand Trunk last winter on the coldest portion of the road, between Montreal and Lachine, Canada, along the banks of the St. Lawrence River. During this period the thermometer had ranged from 30 degrees above to 20 degrees below zero, the average temperature for December being 5 degrees above zero. In the coldest weather from five to ten minutes' application of steam every two hours gave a temperature inside the train from 68 degrees to 72 degrees. The train was left out on track every night at ten o'clock at 70 degrees, and at 5:30 next morning would show from 30 degrees to 40 degrees. A second train of four cars has been completed for this road, and is running daily on the Island Pond route. On March 11 the engine broke down near Island Pond, and a freight engine was attached; the train was without steam for five hours, and on arrival at Montreal the thermometer registered 65 degrees in the cars.

Tests of an equally satisfactory nature were also made on the Intercolonial, the Shenandoah Valley, the Chicago, St. Paul, Minneapolis & Omaha and other railroads. The chief office of the company is in Baltimore, Md.

The St. Louis Car Company, of St. Louis, Mo., have just taken an order to furnish the St. Louis & Suburban Railway Company with 120 cars. They are very busy in all their departments.

Since Mr. Geo. H. Poor became general manager for the Boyer railway speed recorder it has been put on a large number of locomotives in the West. The device is growing rapidly in popularity.

The Universal Radial Drill Company, of Cincinnati, O., have recently shipped to the Homestead Steel Works (Carnegie, Phipps & Co.) Pittsburgh, Pa., one of their mammoth radial drills, 17 feet high and weighing 16 tons, with a 9 foot arm, and 9 feet 5 inches under spindle for boring armor plate.

A. S. Males & Co., Cincinnati, have just issued their 14th catalogue of material used in the construction and operation of railroads. It embraces locomotives, cars, turn-tables, steam shovels, bridges and a great variety of appliances that can be obtained promptly and on advantageous terms. Parties interested in purchasing these things would do well to send for the catalogue.

B. M. Jones & Co., sole agents in the United States for the celebrated "R. Mushet's Steels" and "Taylor" best Yorkshire bar iron, have established a New York office at 143 Liberty street, "Central Building," and are prepared to give New York delivery of the goods they represent to those of their customers who may be better served thereby. Their principal office remains at 11 and 13 Olive street, Boston, as heretofore.

The Mt. Vernon Car Manufacturing Company have recently received an order of 400 refrigerator cars for the Union Refrigator Transit Company, of St. Louis. The cars are to be used by the Pabst Brewing Company, of Milwaukee; Schlitz Brewing Company, of Milwaukee; the Sioux City Dressed Beef and Canning Company, of Sioux City, and the Liverpool & Des Moines Packing Company, of Des Moines, Iowa. They are also working on 200 box cars for Major Henry O'Hara, of St. Louis.

Our Directory.

Atlanta and Florida.—E. L. Tyler has been elected president, vice R. Maddox, resigned.

Birmingham, Sheeffild & Tennessee River.—E. Marsh, superintendent, has resigned.

Central Vermont.—D. Mackenzie has been appointed purchasing agent.

Charleston, Sumter & Northern.—J. H. Averill has been appointed general manager.

Chesapeake & Ohio Southwestern.—B. Cutter has been appointed general superintendent, vice J. L. Frazier, resigned.

Chicago & Eastern Illinois.—Frank Bruce has been appointed general master mechanic, vice C. J. Clifford, transferred.

Cincinnati, Wabash & Michigan.—S. B. Tinker, superintendent of motive power, died April 11 at Wabash, Ind.

Columbia & Puget Sound.—J. R. McCormick, master mechanic, has resigned.

Covington & Macon.—H. Wilkins has been appointed superintendent with office at Macon, Ga.

Flint & Pere Marquette.—H. C. Potter, vice-president and general manager, has resigned.

Gulf Colorado & Santa Fé.—J. Billingham has been appointed division master mechanic, vice J. H. Dougherty.

Kentucky Union.—J. Phillips has been appointed general superintendent, vice L. Hege, resigned.

Lehigh Valley.—P. Hoficker, master mechanic at Weatherly, Pa., died recently in that city.

Louisville, New Albany & Chicago.—W. H. McDoel has been appointed general manager, vice W. F. Black, resigned.

Milwaukee, Lake Shore & Western.—R. Quayle has been appointed master mechanic, vice J. Hickey, resigned.

Newport News & Mississippi Vallcy.—M. B. Cutter has been appointed superintendent of western division, vice J. L. Frazier, resigned.

Richmond & Danville.—G. R. Talcott, division superintendent, has resigned.

St. Louis, Arkansas & Texas.—W. T. Smelton, division superintendent, has resigned.

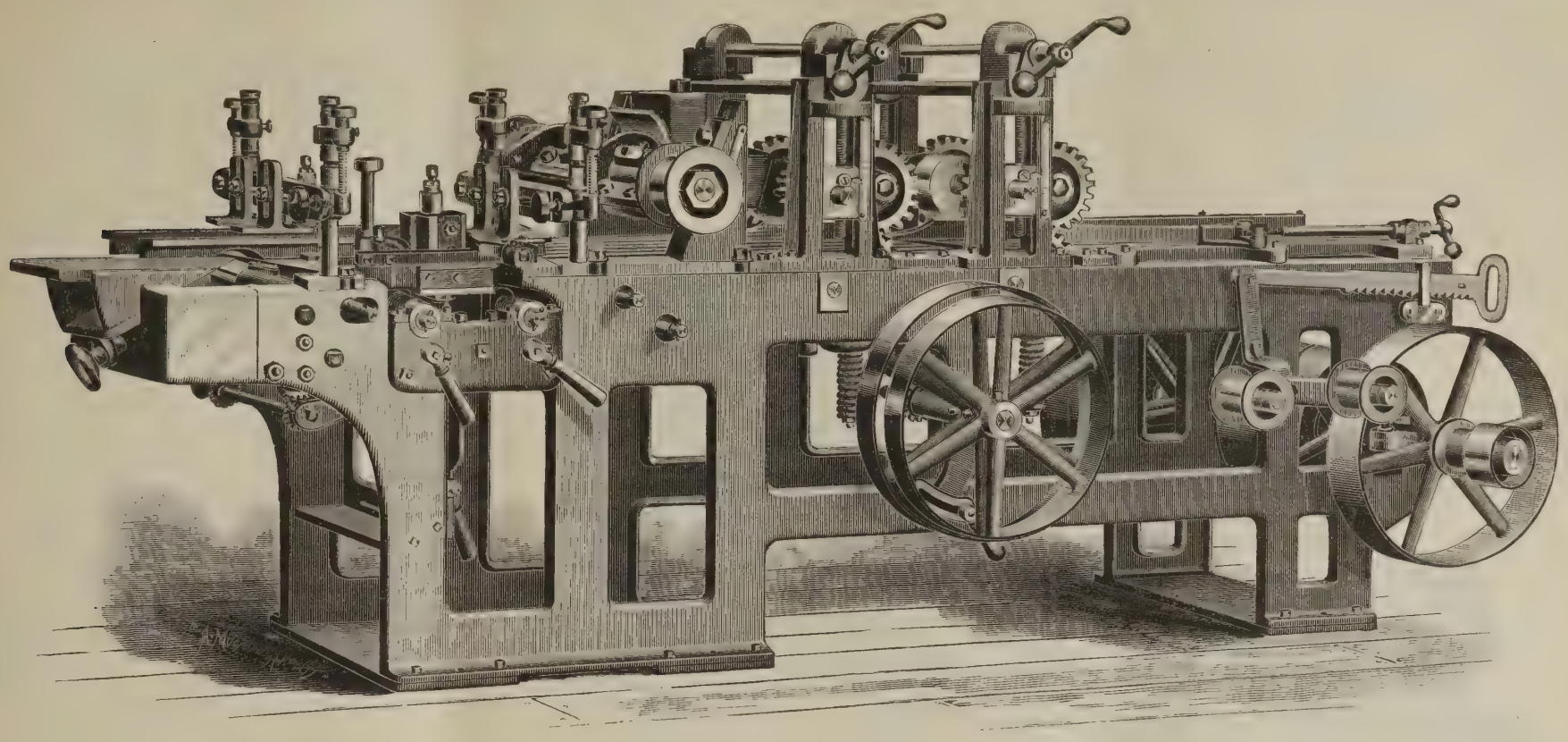
Southern Pacific.—L. R. Fields has been appointed superintendent of Oregon lines.

Union Pacific.—E. Conkingham has been appointed superintendent Pacific Division, vice A. H. Crocker, resigned.

Employment Wanted.

WANTED—A salesman acquainted with the railroad trade to represent one of the largest varnish companies in the country. State previous experience. Address Varnish, P. O. Box 47, New York City.

WANTED—Superintendent for a corporation doing a large business with street railways and engine builders. Must understand the construction of electric car trucks and general wants of street railways; must also be a thorough mechanic and able to command confidence and trade of such companies. To such a man an exceptional position is open. Address John N. Reynold, 140 Nassau Street, New York.



ROGERS' INSIDE MOLDER.

This machine is a very radical change from our other molders, and is possessed of some new features that will recommend it to every practical operator. It is built in two sizes, to work 10 inches and 13 inches wide, respectively, and up to six inches thick, with all necessary adjustments for sticking moldings of every style, as well as flooring and ceiling. The top and bottom cylinders are made from crucible steel forgings, and slotted on four sides. The top cylinder is adjustable endwise across the machine, making great saving in time in setting molding cutters. Both top and bottom heads are adjustable to cut by means of hand crank, and are both yoked together to avoid cramping.

Side spindles are both adjustable from either side of the machine, and both tilt in either direction for bevel work. The side yokes are provided with matcher plates which adjust with the heads, and also have independent adjustment to regulate the opening around the head. These plates completely fill the section of the bed between the top cylinder bed and lower cylinder chip breaker, a great advantage in running small molding.

All bonnets, chip breakers and pressure bars are arranged to swing clear of the cutters in the heaviest work, and may be drawn back, or removed entirely, when setting or sharpening knives. Opening in the bed of lower cylinder may be increased or diminished at pleasure, and the end of the frame swings off to admit of easy access to lower cylinder.

Feed on this machine is exceptionally strong, rolls being large and geared at both ends. Top and bottom feed shafts are removable, so that the rolls may be easily removed and spur rolls substituted. All necessary changes of the feed are provided for. Tight and loose pulleys on the countershafts are 14 × 6, and should make 820 revolutions, giving cutter heads 4,000 revolutions.

Belting required: 51 feet 9 inches of 3½-inch for top and bottom cylinders, 45 feet 9 inches of 2½-inch for side spindles and feed.

Further particulars about the machine may be obtained from the makers, C. B. Rogers & Co., Norwich, Conn. In a private letter about this machine the makers say: This is one of the most recent of our productions, is from new design, and is, we believe, the best inside molder on the market. Its reception by the trade has been most favorable and we have been successful in placing a large number of machines, all of which are giving excellent satisfaction.

Q. & C. Trolley Car Door.

Experience of the last few years has demonstrated the requirements of a freight-car door that it shall be strong spark-proof, of simple construction and few parts. These are all claimed in the new Q. & C. trolley door.

The best malleable iron is used for hangers, wheels, stops, etc., and steel track, made of one piece for any width of door, applied so that no screws or nails can possibly come in contact with the running parts of the door. A complete housing cap is made of metal, with malleable iron ends riveted together and ready for application.

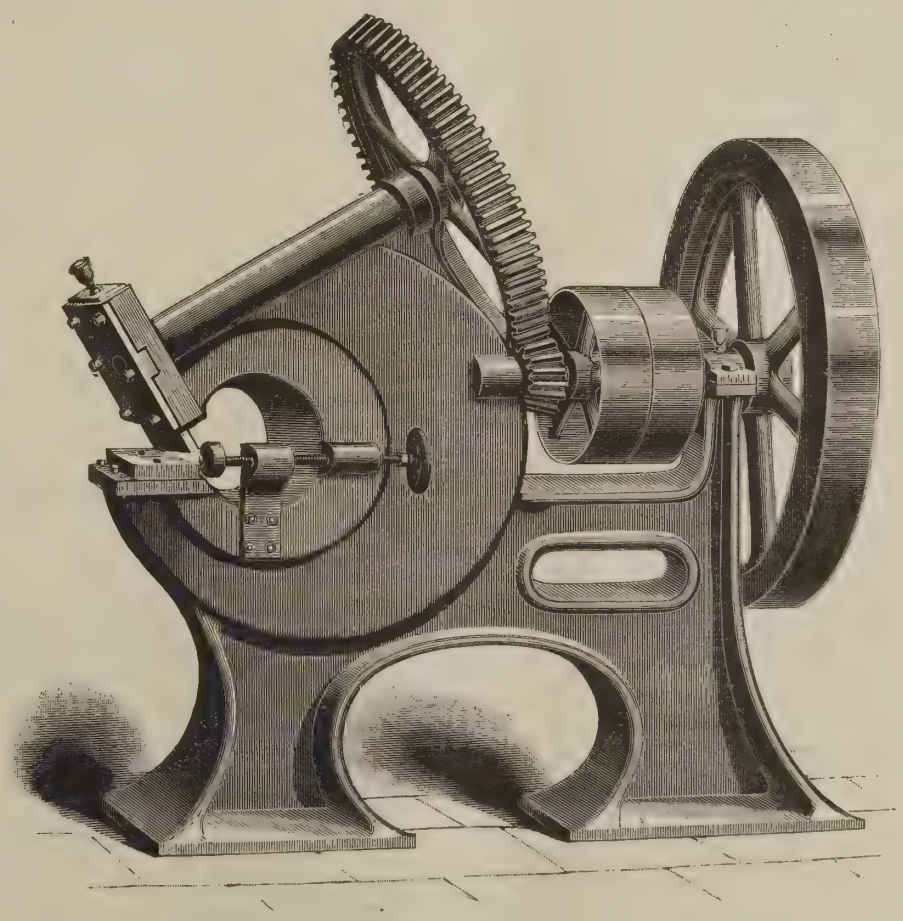
A new feature is the supply by this company of malleable iron guides and wedges for bottom of door, which, by their construction, offer also a thorough lock when the door is open or shut, saving all damage by door slatting.

Blue prints and price lists in detail are now ready for this new door.

The Excelsior Machine Works, owned by Leighton & Hathaway, Cleveland, O., cover a plot of ground 400 × 500 feet. The different departments are fully equipped with the latest improved tools, machinery and appliances. Here fifty skilled hands are employed, and the machinery is driven by a powerful steam-engine. Messrs. Leighton & Hathaway manufacture to order Excelsior rotary planers, Reeve upsetter and former, punches and shears, pumps, hydraulic presses, railway supplies, boilermakers' tools, contractors' iron work, iron roofs, etc., and also carefully attend to black smithing and general jobbing. Their Excelsior rotary planers are made from Mr. Leighton's patterns and designs. These planers have met with great favor with the trade as being the best, strongest, most simple and easily operated machinery of the kind in the market, and have proved exceedingly valuable to manufacturers.

Beveling-Shears.

The above is a cut of a new machine for beveling boiler-plate and angle iron, made and sold by Leighton & Hathaway, Excelsior Machine Works, Cleveland, O. It is so constructed that the plunger is flush with face of head, and the shear blade flush with front of plunger, thus giving a perfectly unobstructed view of the work as is absolutely necessary if anything like accurate work is to be done.



BEVELING-SHEARS.

The firm builds this tool of two sizes, No. 1 one weighing 5,000 pounds, with capacity for shearing plate up to three-quarter inches thick, and No. 2 weighing 7,600 pounds, capable of beveling one-inch plate.

This tool is well and strongly made—the workmanship of the same character as the makers' other tools of the same class, punches, shears, etc.

F. W. Thayer, formerly of Thayer Manufacturing Company, Milwaukee, and of Standard Journal Bearing Company, Chicago, has recently purchased and greatly enlarged the plant of the late E. A. C. Du Plaine, located at 240 South Jefferson street, Chicago, for the manufacture of car journal bearings, castings and anti-friction metals.

The Westinghouse Machine Company wish to let all steam engine users know that they make four types of engines; that the parts are made to hardened steel templates, and are consequently interchangeable; that both engines and repairs are carried in stock, and that all goods are sold through the medium of resident agents in every part of the world.

The Drexel Coupler.

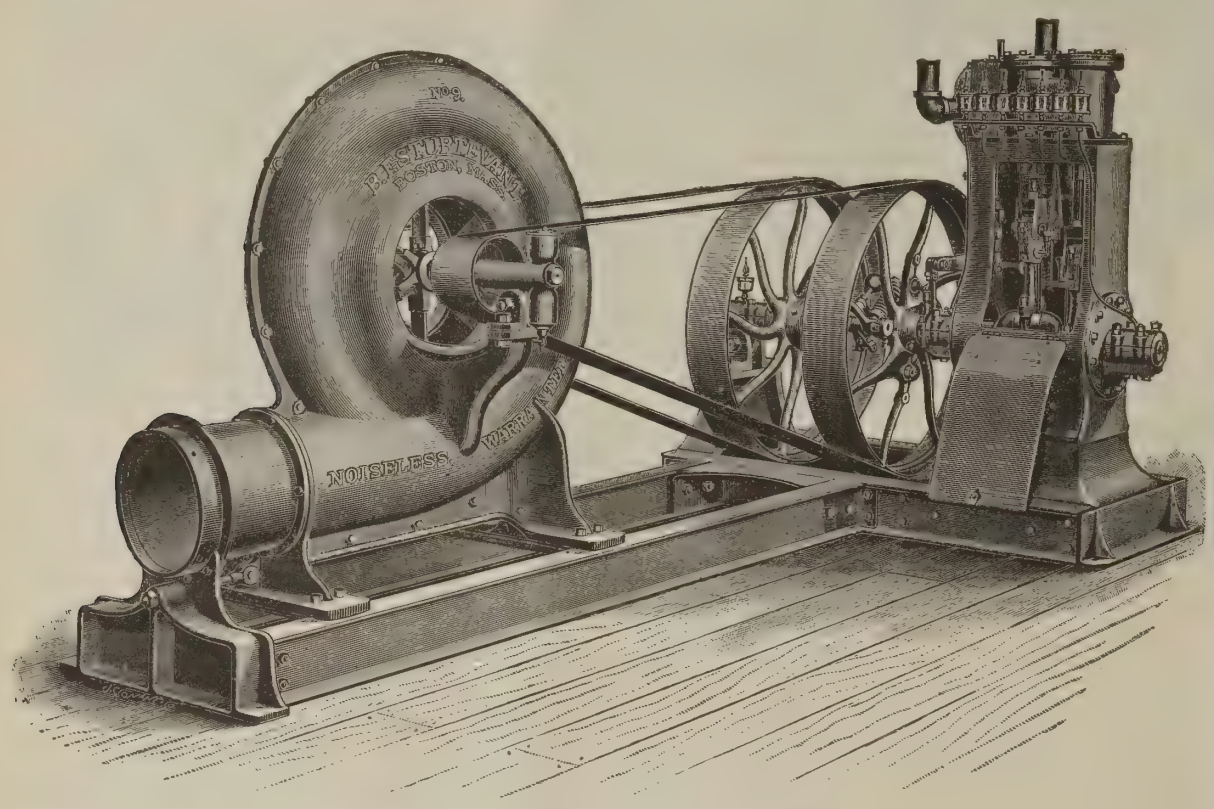
It was our intention to have given a full illustration of the new Drexel coupler in this number, but, owing to a delay in the cuts, we are obliged to postpone it till a later issue. The Drexel is a vertical plane coupler strictly on the M. C. B. lines. It has several novel features. The principal one of these is the ability to swing the knuckle open from the side of the car. This is accomplished in a very positive manner, as will be shown in the illustration. One of its other features is the great strength of the knuckle and head. The knuckle is fulcrumed back much farther than usual, making the ears of the head shorter, thus making the head more compact and stronger, and at the same time giving additional strength to the knuckle by placing more metal between the link slot and fulcrum pin. This added metal greatly strengthens the lugs for the buffing strain. The lock is carried in the locking arm of the knuckle, another new feature. This locking arm is very long, thus reducing the strain on the lock itself and reducing to a minimum, the effect of wear on the lock in rotating the knuckle outwards. The coupler is made of the very best metal.

The offices of the company are at 219 La Salle street. "The Rookery," Chicago. H. O. Nourse is the general agent.

The Sturtevant Blower.

The special arrangement of steel pressure blower on adjustable bed with double upright inclosed engine shown in the accompanying cut is a recent design by the B. F. Sturtevant Company, of Boston.

The blower is of their well-known steel pressure blower type, but mounted on an I-beam foundation frame, to which it is securely bolted, and upon which it is readily adjustable by means of the adjusting bolt shown at the outlet end. By the use of this bolt constant pressure is maintained on both belts, avoiding stoppage for relacing the belts, and making it possible to run continuously without the disastrous effects incident to loss of time by shutting down to tighten belts when a heat is in the foundry. The outlet is arranged in telescopic form, so that the adjustment of the blower in no way affects the position of the pipe.



STURTEVANT BLOWER.

Firmly connected to the foundation of the blower is the engine foundation, supporting the engine and its extended shaft, upon which are placed two pulleys or band wheels. The engine is specially designed by this company, and is double in form, comprising two cylinders supplied by a single valve, and acting upon the shaft through the two cranks, which are situated opposite each other. By this means the engine is perfectly balanced, and the highest rotative speed may be attained. To avoid all danger to the bearings from the flying dust, so common in localities where this blower is used, the entire engine is inclosed, although its parts are readily accessible through the door shown in the cut. In addition to the advantages, the inclosing of the parts prevents the throwing of oil, and makes it possible to leave the engine unattended. All wearing parts are of steel and of large size, so that the friction is reduced to a minimum. The cylinders are bolted to the frame and can be easily removed for reboring. The oiling of all parts is accomplished by a series of sight-feed oil cups placed together upon a bracket attached to the frame of the engine. From these oil cups tubes lead to the various bearings, so that the lubrication is always positive and easily accomplished. The perfect regulation of the engine is secured by the shaft governor, forming a part of one of the pulleys, and acting through the eccentric to change the throw of the valve and vary the cut-off from 0 to seven-eighths stroke. All three bearings are of the brush oiler type and provided with reservoirs from which all surplus oil is fed back to the bearing. Owing to its compact nature this arrangement of engine and blower is readily portable, and the power required for running the blower being independent of any other means of driving, the whole apparatus may be put in use at any time independently of any other power plant in the establishment.

The Chicago branch house of the B. F. Sturtevant Company has been removed to new and enlarged quarters at 16 South Canal street, Chicago.

Improved Automatic Square Chisel Car Mortiser and Borer.

The above engraving displays a most recent heavy improved car mortising and boring machine of the type using square or hollow chisels. It is especially designed for, and capable of cutting the heaviest mortises in hard or soft wood, from ⅛ inch to 9 inches deep, leaving each mortise entirely free from chips. It will also make end tenons, gain or mortise clear through a 9-inch timber, also countersink for bolt heads. Its high efficiency and adaptability to the work for which it is intended, and the great variety of work which can be accomplished with it at one handling of the timber, makes it one of the greatest time and labor saving machines of this class ever brought forward.

The column is one entire casting cored out at the center, strongly braced and thoroughly able to withstand any strain or shock that may be given it. All working parts are planed perfectly true and in line with each other.

The bed rests on the main column, held in position by gibs, the cross movement being controlled by a friction clutch provided with stops to gauge the length of mortise. The upper parts of the bed which holds the timber have an extra movement, operated by a handwheel and screw, to guage the depth of mortise. All other makes of this style of machine have a stationary bed, and the depth of mortise is made by blocking up behind the timber that is being mortised.

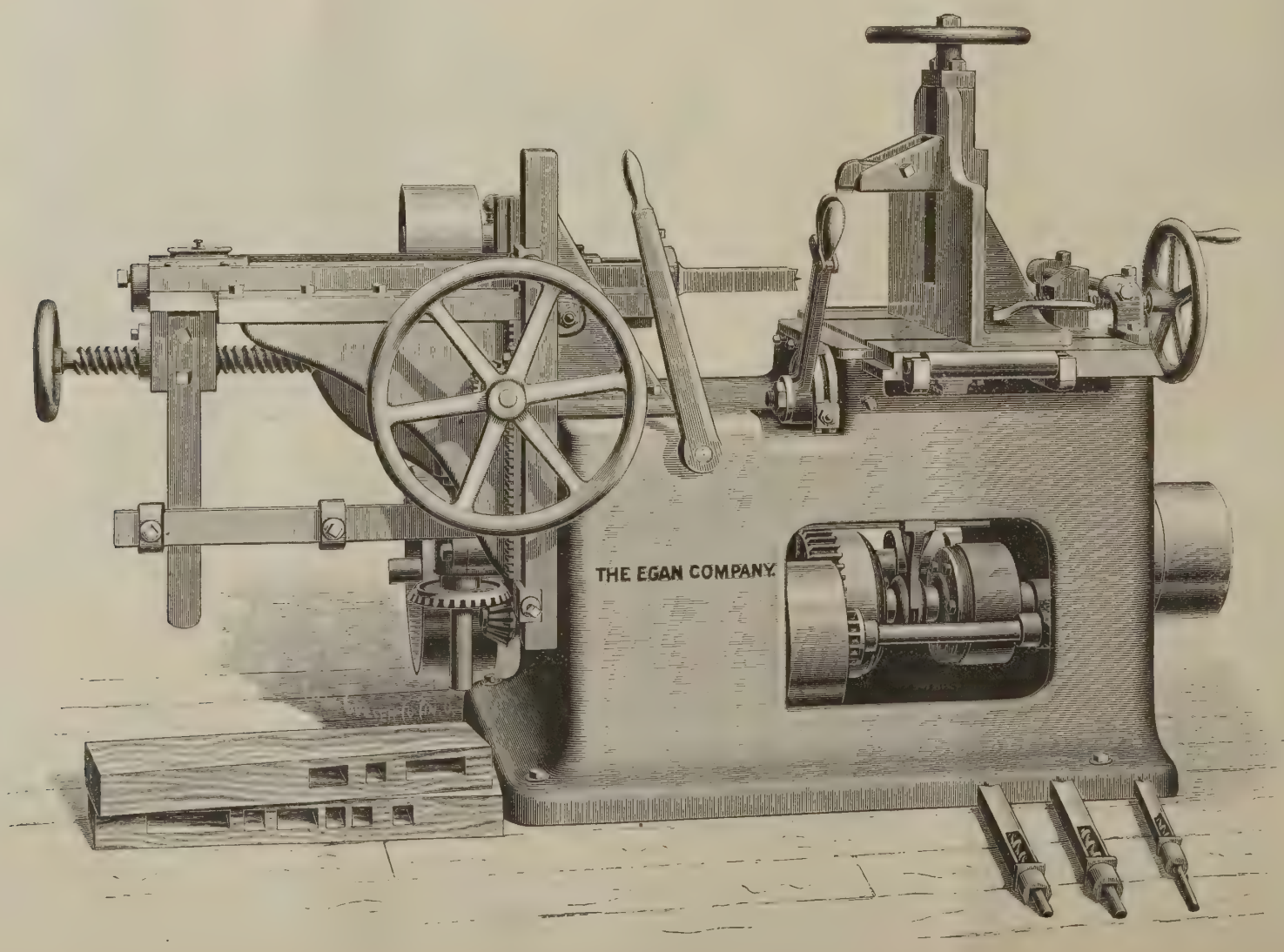
The chisel mandrel is driven by our new improved friction and gearing with a quick return, and raised and lowered by rack and pinion. There are suitable stops provided for guaging the travel of the slide, also a regulating screw for changing the position of the chisel to suit the work. The machine will take in stock up to 16 inches wide and 14 inches deep, and cut a gain at the top of a 12-inch timber.

If necessary an extra boring attachment can be fitted to the machine for boring joint bolt holes, side sills and general work, and when so made the builders furnish one auger each $\frac{7}{16}$ inch, $\frac{13}{16}$ inch, and $\frac{13}{16}$ inch, by 10 inch twist, or any other size to suit the work.

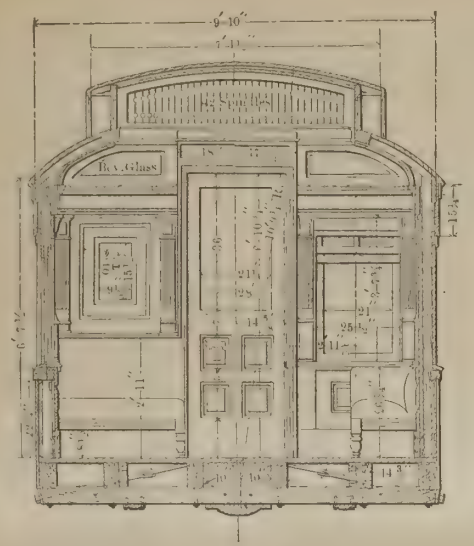
They furnish with the machine four chisels ½ inch, ¾ inch, 1 inch and 1¼ inch, with augers to suit.

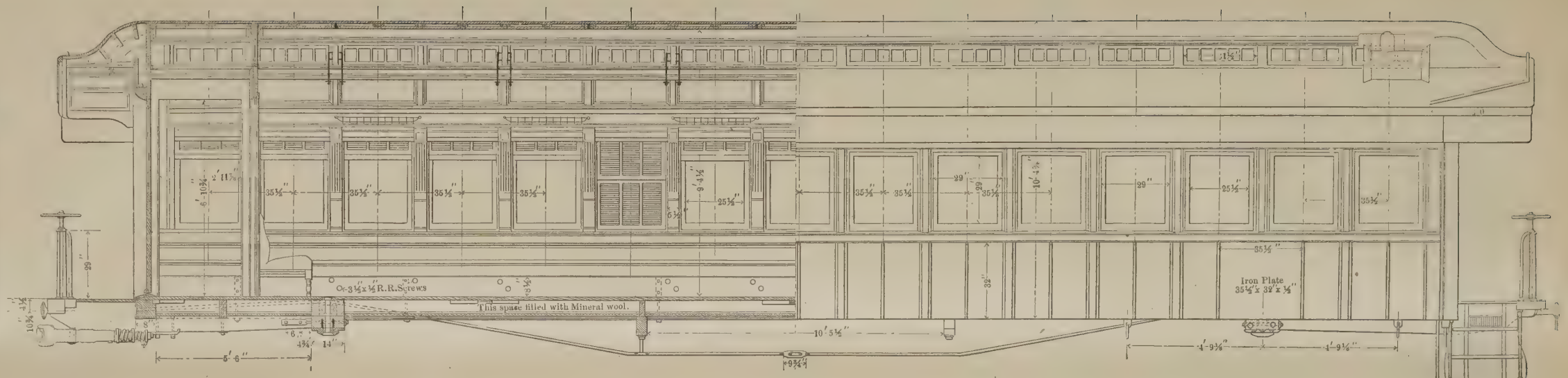
For further information address the originators and builders, The Egan Company, Nos. 235 to 255 West Front street, Cincinnati, O., U. S. A.

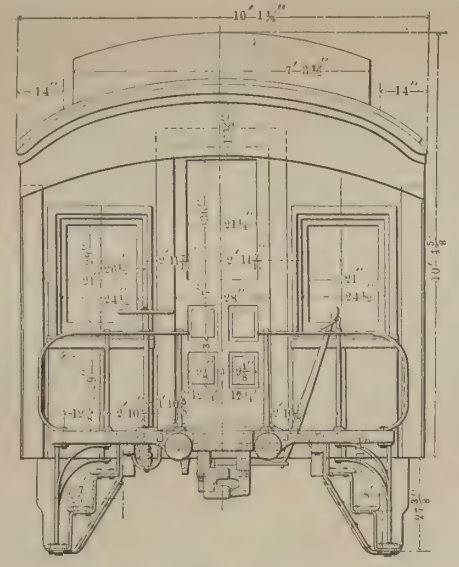
The Serve ribbed boiler tube, which is rolled with fins projecting into the path of the hot gases, has been used to a considerable extent in Europe with great increase of economy, and it has lately been introduced into this country. A special exhibition test was made for ten days at the Moore Works, Elizabethport, N. J. The boiler in use for test purposes is of the vertical type, 42 inches in diameter and 9 feet 6 inches in height. It is supplied with a furnace 36 inches in diameter, sixty-three 2½-inch tubes and a 15-inch uptake. It was first supplied with a set of plain tubes, and its efficiency as a water evaporator ascertained; the plain tubes were then removed, a set of sixty-three 2½-inch ribbed tubes inserted, and its efficiency as a water evaporator ascertained after the change. The ribbed tubes have about double the heat-receiving surface exposed to the flame that the plain tubes have, while both have the same outside heat distributing surface. The results of the experiments have not as yet been figured out.

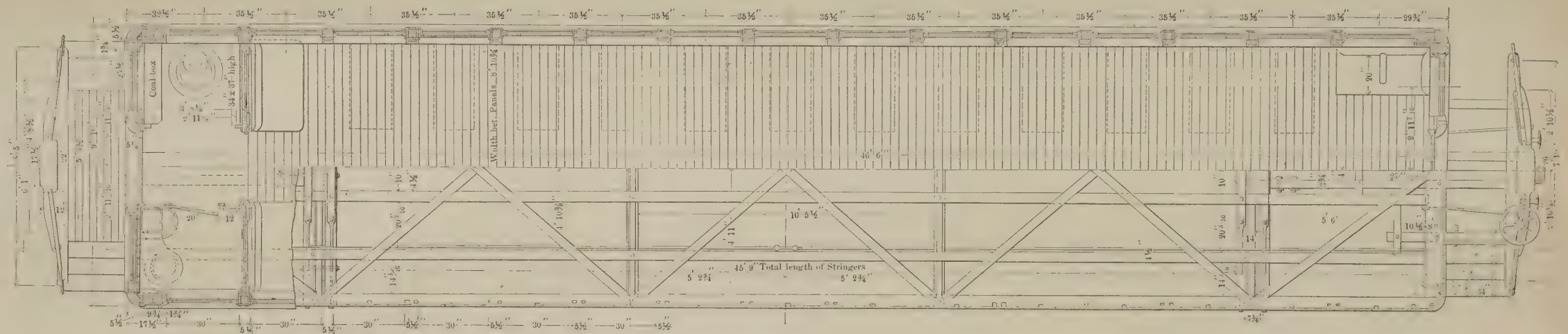


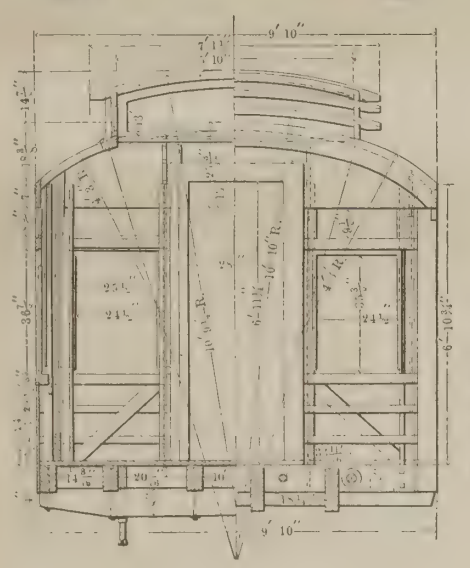
EGAN MORTISER AND BORER.

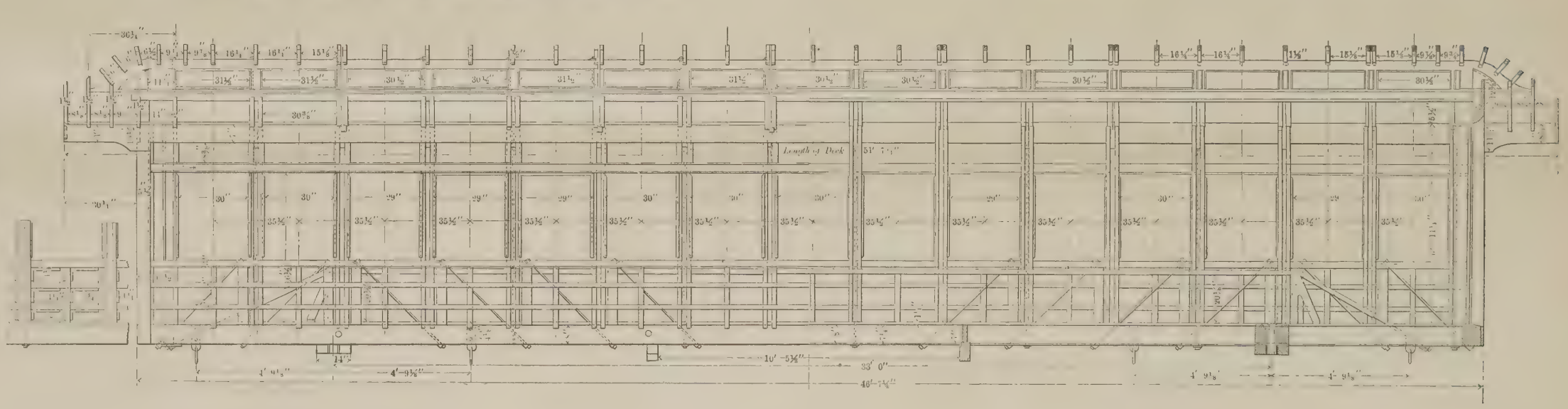












PENNSYLVANIA RAILROAD STANDARD PASSENGER CAR.

NATIONAL CAR AND LOCOMOTIVE BUILDER

JUNE, 1891.

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The Lyal Hanna Coal Company are letting contracts this week for 500 cars.

The Brooklyn Bridge Company are reported to be in the market for 20 additional coaches.

The Baltimore & Ohio, it is stated, have ordered 40 coaches from Pullman.

The Pennsylvania Railroad Company have in their employ 64,282 men.

The contract for 40 coaches for Brazil, on which figures are being made by the different builders, have not yet been let.

General Manager Bradbury, of the Lake Erie & Western, let a contract to the Haskell & Barker Car Works of Michigan City for the building of 500 box cars.

The New York Lake Erie & Western are about to order 50 ten-wheel locomotives with Wootten fire-boxes. The engines are intended for heavy passenger and fast freight trains and will each weigh about 135,000 pounds. The cylinders are to be 20 × 24 inches and the driving wheels 62 inches diameter.

At a meeting of the New England Railroad Club, Mr. Chamberlain, speaking on interchange of car rules, urged that it would be an improvement to require that defect cards be fastened with four tacks. He had found cards properly filled up but fastened with a single tack in the middle. Many cards, he alleges, are torn off and lost by being insecurely fastened.

Among the recent notices of patents granted is one to George W. Morris, Pittsburgh, for an improvement in locomotive springs. It is the tapered spring buckle that we illustrated some time ago, with an improvement added. It is described as a banded elliptic half spring, composed of graduated leaves and having a tapering clamping or binding band formed with a convex bearing end and a concave seat therefor.

We have the authority of a Niles, Mich., paper for the story that when the pay due to a young brakeman who was killed by an accident on the Lake Shore Railway was received by his relatives at Adrian it was found that 25 cents had been deducted for the unfinished part of the run. We agree with the paper referred to that the infinitesimal magnanimity is startling, and, we would add, disgustingly contemptible, if true.

An engineering journal with claims to some knowledge of railroad operating says that the rail is the proper place to do train braking on, and it has discovered an invention to do the stopping of trains by dragging a shoe on the rail. Failures of devices invented for this purpose were as common a few years ago as the failure of traction increasers. The editor of a paper of educational pretensions ought to know something about history.

The Supreme Court of the United States has decided that it is lawful for States to tax Pullman cars. The case which led to the decision was raised in the State of Pennsylvania, which imposed a tax. The Pullman Company contended that the tax was unconstitutional and appealed to the courts with the result mentioned. Nearly all other States have been waiting for the decision, and the Pullman Company will now have numerous tax demands made upon its finances.

An inventors' association has been formed in Washington, the leading object of the organization being to protect the rights and privileges of inventors and manufacturers. If this association exerts any influence to accelerate the transaction of patent-office business, and to prevent the government from placing burdensome and unnecessary charges upon inventors, it will perform a work worthy of support and commendation. The directors of the association are all influential men.

A friendly correspondent, with a love for strong adjectives, writes that our remarks about the names of towns in Ontario was a gross libel on the Dominion, and ought to be the subject of international attention. Stratford, he alleges, is on the Avon; London on the Thames, a river, too, that was large enough to drown 193 persons nine years ago. Although it may not have a tower, it has a St. Paul's and a Westminster, fair models of the older edifices. The new Dublin has a castle (doubting) and Durham has a cathedral.

Mr. W. H. Thomas, Superintendent of Motive Power of the East Tennessee, Virginia & Georgia Railroad, says that the compound locomotives have been running right along, doing good service with a saving of fuel, and, with the exception of several broken pistons caused by defective castings, we have experienced no appreciable difference in the cost of repairs between these and our simple engines. Our compound passenger engine has not lost a single trip except when laid up on account of broken piston, and is now steaming more freely than at first, with a corresponding saving of fuel.

Some parties in New York have been making a show of an invention to prevent railroad accidents which they describe as simple. We do not think it is so complex as the Jacquard loom, but we know of several appliances for preventing accidents that we would prefer to this one. It calls for a second track to be laid inside the main rails and electric appliances in the cab of every locomotive to make connection with this second track. The parties who propose things of this kind are in blissful ignorance of the fact that a perfect system of track protection is in use without any second line of rails.

Pullman's Palace Car Company has the order for 99 cars for the C. & N. W. and C., St. P., M. & O. railways. The order in detail includes 79 first-class coaches for the C. & N. W., 10 first-class coaches for the C., St. P., M. & O., six chair cars for the C. & N. W. and two combination and two baggage cars. The coaches are to be finished in mahogany and to be elegant in design. The chair cars are to be as handsome as any turned out of any car works. They are equipped with large toilet and smoking rooms, six-wheel trucks and all the latest designs. The Scarritt Furniture Company has received the contract for seats for the entire order.

Our facetious correspondent, "Dope Bucket," makes several good suggestions about defect cards in his letter in another column. The recommendation that a holder should be provided for defect cards is well worthy of being followed. Tacking the defect card to one of the timbers appears to be as crude a way of doing the job as could be chosen, and it was excusable only when the use of defect cards was rare. The application of defect cards is now so common that it is high time recognition was made of the practice and a receptacle provided for the card where it could be in a legible condition till taken out by the parties doing the repairs called for.

A search light for railway purposes was tested recently by the electrician of the Jersey Central Railroad. One Huntington light of 3,200 candle-power was mounted on the switch-signal bridge, 20 feet above the track. It is said that when turned on a station building one-third of a mile away even the outline of the bricks could be distinctly seen; when turned on the track the ties could be seen in front of the same station. Colors were plainly distinguished at a half-mile distance. At 1,500 feet it would enable an engineer to tell the position of switches. The reflector was parabolic like those of locomotive headlights, and was silver-plated and highly burnished.

The management of the Baltimore & Ohio Railroad Company announce that there will be an extra sleeper placed on the B. & O. trains leaving Chicago on Friday, June 5, at 10:10 A. M., and on Saturday, June 6, at 2:55 P. M., kindly tendered by Pullman's Palace Car Company for the use of the Western members of the Master Car Builders' Association who wish to attend the convention beginning June 9 at Cape May. The former train will arrive in Philadelphia on Saturday at 3:22 P. M., and the latter at 8:15 P. M. on Sunday; any further information needed can be obtained from Mr. E. W. Grieves, Master Car Builder of the B. & O. R. R.

Every one should try to do good. You don't know how nice it is till you try it. When we began to try to persuade railway officials to treat only with railway employés relative to grievances, we did not know that two out of three members of the Board of Adjustment of the Brotherhood of Locomotive Firemen on the Union Pacific were idle agitators who were there simply to push their objectionable carcasses under the noses of railway officials and use their membership as a means for holding the railroads up for passes or any other favors they might want. Such, however, is the case; but things have changed. Railway officials in this part of the vineyard have ceased to recognize any person who is not an employé of the company interested (except, of course, grand lodge officials). This brings the men and the management nearer each other, and will work great good both to the employer and the employed. We would suggest this motto over the door of every general office: "It used to be the caper, but it don't go now."—*Western Railway.*

A locomotive belonging to the Connecticut River Railroad has been equipped with a Boyer speed recorder, and the natives of the Nutmeg State are receiving revelations about the speed of passenger trains never before dreamt of. A local paper says: "It seems a little odd to think of a train on the Connecticut River Railroad running faster than a mile a minute, but such a thing is being done by the South Vernon express, that leaves here at 12 M. and returns at 6:27 P. M. The rate of 62 miles an hour is, of course, not kept up continuously, but a high speed is nevertheless maintained, a clip of from 50 to 60 miles an hour being thought little of if the train happens to be late."

A device that will enable a railroad employé to determine when a car is loaded consistent with safety or with economical wear has been a long "felt want" in railroad circles. An apparatus has been invented to supply this demand, and owing to its simplicity it is likely to come into great favor. The device consists of two distinct parts, the upper part being attached to the truck above the spring on the side of the car, while the other part is fixed below the spring. An adjustable pin is carried by the top part, and the bottom end of this touches an index finger that works over the dial of the bottom piece. When the apparatus is once adjusted, the index, as the car is loaded, will indicate on the dial "full load" or "overloaded" as the case may be.

General Meigs wants the tenders of locomotives pulling postal cars made sloping in the back end, so that in case of collision the postal car will slide up the back of the tender and escape being crushed. In an interview with a reporter General Meigs expatiated at great length on this subject. He held that the end of a tender, as at present constructed, acted like a ram on the car next to it in case of accident. We must differ from the views of this big military man, and humbly express our conviction that the present form of tender is weaker in a concussion than the end of most postal cars, and that a sloped tender would make a wedged weapon of offense that would be much more effective in crushing through a car than the present shape.

Mr. T. W. Worsdell, locomotive superintendent of the Northeastern Railway of England, continues to build compound locomotives, the experience with the engines in use being highly satisfactory. The Worsdell compound is of the two-cylinder type, the proportions being about the same as those of the Schenectady compounds, with which many of our readers are familiar. Ten new compound locomotives have lately been built at the Gateshead shops for fast passenger service. They have a stroke of 24 inches the high-pressure cylinder is 20 inches and the low-pressure 29 inches diameter. The driving-wheels are 7½ feet in diameter. These engines use about 22 per cent. less fuel than the simple engines while pulling the same kind of fast passenger train.

The Baldwin Locomotive Works have received an order for twenty compound locomotives for export to Brazil. The order comprises six different classes of locomotives, half being for broad gauge lines and half for narrow gauge lines. There are four 65-ton consolidation freight locomotives, three 50-ton express passenger locomotives and three 50-ton mogul locomotives for the standard-gauge lines, and the same number of engines and the same types for the narrow-gauge lines. The Baldwin Works have built or have under order at this time 40 compound locomotives, and they have assumed a regular place in their output. The firm is providing by special machinery for the rapid and economical finishing of the compound cylinders.

The leaders of the Order of Railway Conductors have for the last seven or eight years attracted abnormal attention to their organization by dwelling on the honor and glory they were entitled to as a strictly-pledged non-striking order. The individual members have at various times found but scanty comfort in the non-strike principle, and the sentiment flowing from this feeling has slowly but surely been leavening the lump; but the leaders insisted with increased vigor that the order had nailed the motto of "no strikes" to its head caboose, and there it would float as long as the order had an existence. Some of them are now yelling, "Consistency, pull in thy latch string," for at a convention of the Order held at St. Louis last month, the delegates, by a vote of 293 to 7, decided to join the Federation of Railway Employés, an organization that will use any legal means considered necessary to obtain what is regarded as justice for its members. Many railroad officers are afraid that this is another step for bringing employés in conflict with employers; but we think that there is no cause for apprehension by the managers who are acting justly toward their trainmen. While a strong federation would exert great power in case of a dispute, it has also great power in preventing its members from striking on frivolous grounds. The internal machinery of a federation offers so many checks to precipitate action that the hot blood which generally causes strikes gets time to cool before the permission to strike is given. If railroad managers would study more closely the rules regulating the labor organizations, they would understand much better how to proceed when disputes arose. Ignorance often makes them apprehensive.

Editorial Correspondence.

The Rolling Stock of the Santa Fe.

A GREAT RAILROAD WITH POOR REPAIR SHOPS.

As I rambled around the repair shops belonging to the Atchison, Topeka & Santa Fé during a recent visit to Topeka, Kans., I received the impression that there was a curious want of fitness between the railroad company as a property and the provision for keeping the machinery in running order. There was a time when this company was noted for the lavish expenditures on everything that seemed necessary, and many that were not necessary, for first-class railroad equipment, but by omitting to provide first-class repair shops, the management of the day of luxury neglected a very important element in the forces that work prosperity for a railroad company. The Atchison, Topeka & Santa Fé, with its proprietary lines, is the longest railroad in the world—a road not only great in mileage but great in all that contributes to make a lucrative carrying business. It extends from the lakes to the Pacific Ocean by two arms, while another stretches southeast to the Gulf of Mexico. The trunk and branches of this great railroad traverse regions where originate nearly every species of merchandise or produce which this continent offers for transportation. All that business can do to secure prosperity appears to be assured, and it seems strange to find the principal repair and manufacturing establishment of such a system crowded into small, badly arranged, dark buildings that provide the worst facilities for doing work economically. The machine shops were originally designed for a bridge-building factory, and the intention was that it should be temporarily used for locomotive purposes; but that is twenty years ago, and other makeshift buildings have been added. Entirely new works are one of the most urgently needed improvements contemplated by the present management, and I should think no line of enterprise would bring better returns.

DIVERSE KINDS OF LOCOMOTIVES.

The motive power of this system is of a character that for some years may be depended upon to keep steadily employed the men working on repairs. Mr. Strong, who was, under different titles, so long general manager of the road, provided plenty of work for the men who earn a livelihood by repairing locomotives. Mr. Strong had a mission to make men happy, and he worked for the good of the greatest number, which did not happen to be the stockholders of the company he ran. They were indifferent about who built locomotives, but there were others who looked upon this as being more important even than the question of who shall get the best rooms at the convention. In following the policy of being beneficent all round, Mr. Strong habitually divided up the orders for rolling stock among as many firms as possible. This warmed the hearts of a great many people, and helped divers struggling manufacturers to make a living, but it brought a bad legacy for future managers of the Santa Fé. I have for years been preaching with some persistency the gospel of uniformity in railroad rolling stock, as the only means of reducing the cost of repairs to its lowest terms. Those who doubt the wisdom of my doctrines can find on the Santa Fé system a good illustration of the results of the opposite policy. The company appear to be owners of all kinds of locomotives built in the last twenty years, and no builder who has put engines together in that time has failed to effect sales at Topeka. Besides that, a visitor can examine side by side in the round-house a Strong locomotive, and that engine built to hold the Walker smoke consumer. There is no place that I know of better than Topeka where a thoughtful man may observe dreadful examples of the results that come from the head of a railroad company considering himself the best judge of the rolling stock required. The diverse nature of its motive power is going for years to defeat the efforts of the men now struggling to keep the cost of operating at a low figure, and the blame of this rests on those who were a law unto themselves on the placing of orders for new engines.

ONLY ESSENTIAL REPAIR WORK DONE.

With all the disadvantages and drawbacks that the inferior shop accommodation presents, the men in charge turn out a wonderful quantity of work. The experience that Mr. John Player, superintendent of machinery, previously had on roads with no facilities worth speaking of for doing repairs to rolling stock, has stood of high value to this company, for he has merely carried out old practices on a larger scale. The guiding principle in doing work on the rolling stock is, attend merely to essentials. To produce good results it is necessary that bearings and rubbing parts should be well finished, but parts that are generally polished to look well are non-essentials. These receive little attention here. With locomotives the policy appears to be, keep the tires, rods, journals and bearings in good order, keep the cylinders round and the valves flat, the boilers clean and the heating surfaces free from leaks. When these conditions are preserved the engines are in good working order and can haul trains as well as those that have been the object of much more laborious attention to details. The same common sense practice is adopted in the repair of all other members of the rolling stock family.

GOOD SHOP MANAGEMENT.

The policy of leaving alone all superfluities enables men and tools to turn out what seems to be an extraordinary volume of work, but the efforts of both are aided by the very best kind of shop management. The shop tools are arranged with a view of making it convenient for one man to attend to more than one machine, and numerous special methods are employed for doing work quickly. They use an attachment to a planer which makes the tool cut in a circular form. This is utilized to great advantage in finishing driving axle box bearings. Instead of putting each box on the slotter to have the bearings finished, they put as many of them on the table of a big lathe as it will hold, and the tool finishes them all uniformly. Emery wheel planers are employed very successfully on a variety of finishing operations, all flat surfaces that can be reached being trued in this way. Few shops make better use of the emery wheel in its various forms.

EXPEDITIOUS MECHANICS.

The great amount of work to be done in the shops enables the foremen to keep men constantly on recurring operations, and the dexterity acquired materially increases production. They have one latheman who will turn out a full set of consolidation engine crank pins in a day. Great attention is bestowed upon keeping crank pins true. A journal that is $\frac{1}{32}$ inch out of round has to be trued up. In the month before my visit they put in 84 new crank pins. In the same time they turned 140 driving-wheel tires on three lathes. Two small Bement wheel lathes turn three pairs of wheels a day. Some older lathes are kept busy finishing one pair of wheels a day, but the company feel too poor to use them at present. The air brake and the injector repairing departments of this shop are each run by one man and a boy, and the amount of work done is surprising. They use a boring mill that was not stiff enough for rapid wheel work to bore out axle boxes, face steam chest stuffing boxes, turn up piston packing, and do a great many other things usually performed on the lathe. In this tool a young man bored and faced six driving-boxes in four and a half hours.

WHERE VALUE OF INSPECTION IS UNDERSTOOD.

Although repairing is done under the demand to rush the work, unusually strict attention is bestowed to the inspection and testing of parts seemingly in good order, and liable to have hidden defects that might cause failure on the road. The whole of the running-gear is subjected to the most searching examination, and the slightest flaw in a vital part leads to rejection. Cylinders, with all attachments, and the studs and bolts, steam pipes, dry pipe, are all carefully gone over and defects remedied. They have a novel way of banding cracked driving-wheel hubs. Instead of merely turning up the wheel hub to admit of a band, they turn the crank pin hub also, and face the crank down. The holes for both the hubs are then bored in a forging 1¼ inch thick, and this is shrunk on. It is a stronger plan than the single band, and it prevents throwing the pin out of quarter. Mr. Geo. W. Smith the master mechanic in charge here, is an excellent shop manager, and is full of resources for carrying on the work to the best advantage.

GOOD USE FOR CAR-LIGHTING DYNAMOS.

An experiment in car lighting with electricity was tried by this company, and after a time was abandoned. The dynamos used were sent to the shops, and Mr. Smith is utilizing them to good advantage in dispelling some of the obscurity in the shops. They are run all day. The workmen felt no inclination to resist the change that gave electric light in place of the malodorous torch. The small Brotherhood engines that were used for driving the dynamos in the cars are utilized in the shop as portable power for drilling, boring, planing, etc.

A plain cast-iron stack is used here with chimney and base cast together. It is finished ready to put on for $13. This stack has a plain top without even a rim. The steam passing out causes a slight musical note with the suggestion of a whistle. Quite a number of the engines have been equipped with the concentric expanding nozzle, which we illustrated in October last. The engines have a remarkably soft exhaust, and are said to steam well with a great reduction of fuel.

BAD WATER FOR BOILERS.

I remember once hearing in England some sailors dilating on the attractions of the different countries they had visited. One of them said, "America is the greatest country on the ocean. You can get more kinds of drinks there than in all other countries I have been to." If America is the *ne plus ultra* of mixed drinks for the human palate, the Santa Fé railroad supplies the most diverse mixture of beverages for the stomach of the iron horse. They have on that line all varieties of water known to nature or art. There are in some regions the pure H_2O that falls from the clouds and passes over only insoluble primary rocks that part with no impurity and convey it untainted to the storage tank. That is the exception, for the plains and mountains traversed by the road are rich in minerals that dissolve readily in water, and commoner than the pure product of the clouds is an alkaline-charged mixture nearly as full of solids as the contents of a soda-water fountain. Between the best and the worst there are acid and alkaline waters in great variety, each having its own peculiarity, and the different kinds harmonizing only in the evil effects which they produce on the heating surfaces of locomotive boilers.

THE BOILER SHOP.

Owing to this the boiler shop of these works is of unusually great importance. The extent of the work called for may be inferred from the fact that during the first three months of this year they put in 20 new fireboxes, cut, welded and reset 14,350 flues, made one entirely new boiler, and had sixteen other new fireboxes partly made, besides keeping up the current work of patching, caulking and putting in new stay-bolts. Besides this a great deal of work was done in repairing iron car trucks. This was all done with 135 men working eight hours a day. Mr. Archie Baird, the boiler-shop foreman here, is an exceptionally good man in his line, and there is full scope for all his energy. There are few places where a foreman boiler-maker of intelligence, energy and good judgment is more needed. Owing to the ravages that some kinds of feed-water make on the sheets, vigilant and rigid inspections are necessary to prevent explosions. The best of judgment and ingenuity in searching for defects are called for to prevent boilers from being passed as sound when they are decayed beyond the limit of safety. From what I saw of fireboxes removed and lying in the scrap heap, an ordinary inspector might go over the surfaces exposed to view and find nothing the matter, when the whole of sheets exposed to the water were eaten away in big spots, like huge smallpox pits, till the thickness of the metal was often less than $\frac{1}{16}$ inch. A great many attempts have been made on this road to neutralize the effects of impure water by mechanical separators and chemical reagents, but nothing is used now but the washout hose. Systematic means have been employed to make washing out as effective as possible, and plugs are located so that a strong force of water can be applied to every part of the boiler and firebox, where mud or scale usually accumulates. The tubes in the boilers are set with unusually large clearance space, and in vertical rows. A great many locomotives belonging to this company have the firebox crowns supported by radial stay-bolts, but there is talk of abandoning the practice owing to the cracking of back flue sheets.

THE CAR SHOPS.

The remarks about the inferior buildings that serve as machine shops do not apply to the car shops where our old and popular friend Mr. John Hodge holds forth. He has got modern shops well arranged, and a particularly good planing mill. Mr. Hodge had just finished the rebuilding of a Pullman palace car which had been hammered into fragments in a wreck, and the work done appeared to compare favorably with the best performance of the Pullman shops. There is little or no work going on in the car shops except repairs. An exception is the building of some cabooses for freight service, or rather for stock trains. Each car is made with eight sleeping berths for the accommodation of stock men, and the extra comfort thus provided is highly appreciated. The berths entail little extra expense, as the upper berth is merely a folding shelf which holds mattress and can be put up during the day.

The standard freight car truck of this road is a swing center iron truck of the pattern recommended to the M. C. B. Association several years ago. It is considered a good truck of its kind, but expensive to repair and very often in need of repairs. They are changing it and making the center rigid. The iron trucks are repaired in the boiler shop, and the foreman declares that it occupies his men half the time. When a truck made of channel iron goes into a wreck, it generally comes out ready for the shop, but it is all there, as the darky said when he explained why he preferred getting mashed in a railroad accident to being drowned at sea.

THE PAINT SHOP.

Mr. W. T. Hogan, foreman of the paint shop, keeps the cleanest and most orderly establishment I have ever seen, and his system of doing work appears to be as nearly perfect as it can be made. They were turning out about thirty newly painted passenger cars a month when I was there, besides a very large amount of locomotive and freight work, and the force of men is abnormally small, but the painting is done all the same. The secret of the success in this shop appears to be that the work is moved along in such an orderly fashion that no stroke is lost and no time is wasted between jobs. They have an exceptionally well arranged storeroom and mixing-room. All brushes are cleaned here and stored at night ready for work in the morning.

They have lately changed the color of the passenger equipment from yellow to tuscan red, and are pushing the work of getting over them all to secure uniformity. A plan of uniform lettering has been worked out by Mr. Hogan, and blue prints are kept showing sizes, form, position and color of all letters and numbers for the whole rolling stock. These are sent out to all division points, and must be adhered to in doing work. When there is time to go over all the equipment this road will have as uniform a style of painting and lettering as the Pennsylvania system.

PAINT SHOP RULES AND INSTRUCTIONS.

Not only is the lettering and finish required to be done with uniformity, but all painting operations are controlled according to "rules and instructions," posted in the shops for the information of all concerned. I quote two items taken from the instructions for painting locomotives:

"All coats of paint applied on tank, dome, cab, cylinders

etc., should be well brushed out and laid off with a light touch of the brush. This will add greatly to the drying qualities and make paint free from brush marks all the way through the various coats, giving a good surface. Some few painters will try to see how much surface they can go over in a short time and do not brush paint out properly. Work of this kind will dry on the outside and not next to the iron, with the result that the paint does not "clinch" itself and is a very poor foundation for subsequent coats.

In setting head-light glass in frame, place between ground and plain glass a piece of thin tin, L-shaped, 4 inches long, at both ends of frame, and bore two ⅛-inch holes 9 inches apart in bottom of frame. The tin will prevent the glass rubbing together and the holes will prevent moisture from settling."

TO REMOVE PAINT FROM TANKS.

They have a very expeditious way of removing old paint from tanks and other iron surfaces which is thus described in Mr. Hogan's rules:

"When it is necessary to remove old paint from cylinders, tank, steam chest, driving wheels, rods, etc., use a preparation of 25 pounds potash, 5 pounds sal soda, 1 quart light liquid ammonia, 25 gallons water, made stiff with dry slaked lime and applied with bricklayer's trowel. Let the coat stand from three to six hours, when the old paint can be removed with a wide scraping-knife. Then wash off thoroughly with water and a stiff broom. Dry off with rags and go over surface freely with two parts linseed oil and one part benzine, and scour nicely with wire brush, removing all rust and scale. Then wash clean with benzine and rags, sandpaper lightly, dust off and prime."

NO FOLLOWERS.

Mr. John Player is making a very decided success in his management of the machinery department of this company, and I should like to direct attention to one feature of the policy he has followed. He has made the best use of the personnel he found on the road. Some men, when they go to take charge of a new road, think that to insure success it is necessary to take with them a host of followers and friends to fill the leading positions of trust and responsibility. That invariably arouses jealousy and discontentment among the men who have been working faithfully for the company previously, and the new officer is soon surrounded by covert enemies, where friends are urgently needed. Mr. Player took no followers. He asked for the support and cooperation of the men in the company's service and received it heartily. The only conditions that he exacted were competency and desire to work for the best interests of the company. His success ought to give a lesson to men who pursue the other course. A. S.

Delaware Lackawanna Car Shops.

The five new brick car shops of the Delaware, Lackawanna & Western, at Dover, N. J., under the charge of Mr. J. W. Baker, master car builder, are the best equipped shops belonging to the company. They are extremely busy in these shops at present, and are working full time with a force of 450 men. Among the details of new work on hand is the building of 100 30-ton freight cars, which are put up in very fine style and have Gould automatic couplers. This company does a very large milk business, and uses a special form of car with doors at the end, and a refrigerator which holds 1,000 pounds of ice. Mr. Baker is building 50 new milk cars of this style. He has orders to equip during the coming summer 250 passenger cars with the Gould-Smith-Baker steam-heating apparatus and the Pintsch system of lighting. They are about to erect a fireproof paint shop capable of holding 50 passenger cars. The old paint shop will be utilized for the repair of cabooses and freight cars.

Besides the ordinary repair work, which is very great, Mr. Baker is building five new passenger cars a month. The passenger cars now in the shops are very neatly finished in light oak.

Some Points on Steel Working.

Mr. Charles Blackwell, representing Schoenberger & Company, is showing to master mechanics and others a specimen of steel which is interesting and contains a lesson which those who have anything to do with the working of steel ought to know. The specimen is a strip of ⅝-inch sheet steel, perhaps 10 inches long by three inches wide, which is bent double at both ends. At one end the bend is perfectly clean and the metal entirely sound and uninjured, showing itself to be a good quality of steel. The other end of the same piece, similarly bent, has cracked and almost broken through in the bending. Why has the same piece of steel behaved so differently under the same operation? The appearance of the end which has cracked shows that it has been heated. The perfect end does not. As a matter of fact the perfect end was bent cold. The end where the fractures show was bent at what is known as a blue heat. And this is the lesson: In heating steel, as we know, the color of the metal changes first to straw color and then to yellow and orange, to purple, blue, to a neutral tint and then to a red heat. The metal cools in reverse order. Steel which is bent or worked at any temperature from below the straw color to above blue heat is likely to and will, almost invariably, fracture—no matter what the quality of the steel.

In a general way, of course, it is known that steel ought to be worked at a red heat. The Boiler Makers' Association among their recommendations adopted at the Convention of 1889 says: "Flanging should be done at not less than a good red heat; not a single blow should be struck after plate is cherry red by daylight." But it is not universally known how essential the observation of this rule is. If it were, there would be a good many fewer sheets spoiled in working, and manufacturers would not so often have to submit to the accusation of furnishing inferior steel, when the fault has in truth lain entirely with the working. Steel which can be flanged and bent with safety either when cold or when cherry red will be liable to fracture if bent or worked anywhere between,—from the first straw color to blue heat.

Several master mechanics after seeing Mr. Blackwell's sample have experimented to see whether the rule was universal. Among others Mr. T. W. Gentry of the Richmond & Danville experimented with all the brands of steel that he was using in his shops, and found the same result in each case. The steel cracked when bent at or near a blue heat.—*Northwestern Railroader.*

Truing Journals and Crank-Pins.

Railroad shops are to some extent like individuals, and most of them have some peculiarities in which they excel others. The shop practice of the Burlington, Cedar Rapids & Northern shops, at Cedar Rapids, Ia., compares fairly with the best railroad establishments, but the uncommon gifts and graces of the men in charge of the work lie in the means employed to keep driving-axle journals round and to maintain the crank-pins true. As is well known, the forces acting on the crank-pins of a locomotive tend to wear the main bearings oval or partly eccentric. Unless the journal is kept fairly round there will be useless expenditure of work in friction, and the axle connections will wear rapidly, besides causing danger from breakage of rods and crank-pins. Journals are frequently permitted to pass through the back shop without being trued, owing to the rapid reduction of stock that results from the usual way of turning them down. Two cuts must be taken for the smallest wear, one to go through the hard, burnished surface, the other to finish. This operation frequently repeated soon reduces a journal below the safe limit.

In the Cedar Rapids shops they true up the journals by a plan that merely takes off the part out of round. The driving-wheels are put in the lathe and revolved on their centers in the usual way. A fork carrying an emery wheel is fastened in the tool post of lathe and the wheel is driven by an overhead drum. As the driving-wheels are revolved this emery wheel is applied to the journals, and being guided by the slide rest, the whole of the journal can be reached and ground to the finest cut. When the journal is cut exactly true the emery-wheel it taken off the spindle and a pulley put on, which carries an endless leather belt covered with fine emery. This belt is run at a high rate of speed on the journal and burnishes it as smooth as glass. The whole operation takes less time than it does to true the journal with a lathe tool, reduces the journal less and makes a better finish.

The crank-pin journals are also trued when the wheels are in the lathe. A three-jawed universal chuck is fastened to face-plate of lathe. The crank-pin is passed through the chuck, and the jaws of the latter are closed down on the main collar of crank-pin. The lathe is then made fast in position for quartering crank-pin holes in driving wheels. A yoke is put over the lathe spindle in shifting head to stiffen quartering-machine bar, which is passed through other end of yoke. A U shaped tool is fastened in bar of quartering machine, and adjusted to take cut sufficient to true up journal of crank-pin, and is fed lengthwise by quartering-machine feed.

By turning crank-pins in this way they do not have to be removed from wheel, and they are certain to be turned parallel with the axle.

In speaking about car couplers at the Memphis meeting of the Southwestern Railway Club, Mr. P. Leeds said: In the construction of M. C. B. couplers the entire skill has been expended in making them strong enough to withstand the buffing *when the knuckles are in*, and without them they are at the mercy of any form of drawbar. On this accounnt, if the knuckle is gone (and you cannot replace it) it is the best policy to take out the whole bar, and put in a common one, as by that you only lose the difference between the new cast bar and scrap. On the other hand, as I have said, you are almost assured of the destruction of the M. C. B. type, if left in, and by saving it for repairs you get full value. I think the M. C. B. coupler must be improved in two directions: First, by making it entirely antomatic, so that, when unlocked, it should open and not necessitate a man going in between the cars to set them. Second, with the unlocking levers as now applied, the operator has to pull fore and aft the car, and, in case of the lock or its connections working so hard as to prevent a man from raising the lever at arms length, his body naturally gravitates to a position between the cars, while he is stumbling along over the end of ties. Now, if these levers were arranged so that the pull was across the end of the car and at right angles with the length of the car body, the switchman would naturally throw himself from the car and track as he pulled at one that chanced to work hard. In that position his life would be safe, while in the other it is not.

The indications are that all the directors of the New York, New Haven & Hartford Railroad will be tried for the crime of using stoves to heat their cars, contrary to law. An attempt has been made to have the indictment against the directors quashed on the ground that they were not principals in the offence committed, but the Court decided that, in the case of a misdemeanor, accessories are liable to punishment in the same degree as principals are. This appears to be a very important ruling and one that applies to cases that are of much greater consequence than the charge against the New York, New Haven & Hartford directors. There are many railroads where extremely dangerous practices are habitually followed, due to neglect of necessary appliances or to the employment of appliances that are not safe. The directors of such roads have always comforted themselves in the assurance that the active manager would have to bear the whole responsibility should an accident happen in a district where the community was likely to demand the punishment of the guilty parties. Some of the largest railroad stockholders in the country make themselves excessively obnoxious to managers at board meetings, and oppose every proposed improvement that entails expense. The knowledge that they are liable to be punished as accessories for violations of law due to penurious management may have a wholesome effect, since it seems to be the only way of reaching their consciences.

When it is a question of how slowly freight can be moved along a railroad some of our lines can give points to the most apathetic canals, but American railroads do not enjoy a monopoly in subjecting freight to tedious delays. Some evidence was recently given before a committee of the British parliament which shows that an English railroad company can hold on to freight for a wonderful length of time when it makes an effort. A Buxton coal merchant says that sometimes the Midland Company manage to convey coal from Buxton to Chesterfield in 11 to 34 days, and as the towns are more than 20 miles apart, it will be seen that sometimes the coal trains dash along the line at the rate of two miles a day. Once the witness found a bird's nest in a truck which had been 30 days on the way, and he reasonably believes that the nest was built and the eggs laid during the month. Yet this Buxton coal merchant is not happy, and requires a change!

The John Stephenson Company car builders, of East Twenty-seventh street, has purchased the property known as the Birnie Farm, between Larchmont and Mamaroneck, on the New Haven Railroad, and will erect extensive car works on it. The property comprises about thirty-five acres. It is the intention of the company to begin at once to prepare the ground for the erection of the buildings. The new works will probably be the largest and finest in the country. The business has increased so much lately that the present quarters in Twenty-seventh street, which occupy eleven city lots, have become far too limited, and a change was found necessary to enable the company to enlarge its facilities. Larger cars, especially larger electric and cable cars, are demanded, and in the new factory special arrangements will be made to build these cars. The company will retain its valuable property in Twenty-seventh street for the present. It expects to have the new factory in working order inside of two years.

Solid-End Rods.

Speaking at the St. Louis meeting of the Southern and Southwestern Railway Club, Mr. J. W. Hemphill, of the Jacksonville Southeastern, said:

In reference to parallel rods with solid ends and those with straps, bolts and keys, my experience has been such that I am most heartily in favor of the solid end. We have one engine that has made a mileage of 102,433 miles without the cost of one cent for repairs, and the brasses are only worn out ¾-inch larger than the pin. In this case the composition of the brass is six of copper to one of tin, and the pins are wrought iron, case hardened. I do not believe it possible to run parallel rods with straps, bolts and keys and attain the same result; not only is the maintenance much cheaper, but the first cost of making a solid-ended rod is less then the rod with straps, bolts and keys. I have endeavored to learn of a solid-ended rod breaking, but thus far have not heard of a case; and how often do we have a report of a parallel rod, strap or crank-pin being broken, when, I will venture to say, that nine times in ten the cause would be traced to unequal strains on the rods and pins through injudicious keying?

To avoid the matter of unequal keying, we have for the past year put up the parallel rods without any keys, using solid linings and fitting them so that the belts would draw the brasses, liners and straps solid against the stub end. This way of putting up the parallel rod insures no unequal keying at least, but is not as satisfactory as the solid-ended rod. Some of the objections to the rods with solid ends are that they rattle, but a strip of wood bolted on the inside of the rod is used to some extent to deaden the sound. The rattling seems to be caused by rods where there is a collar interposed between main and parallel rod. I think that if the collar is dispensed with on the main pin and the main rod brass is allowed to come in contact with the parallel rod bushing there will be little or no rattling.

Tests of Mexican Central Compound Locomotive.

Comparative test of a simple consolidation engine and a compound consolidation engine, in the same service on a mountain section of the Mexican Central Railway.

DESCRIPTION OF ENGINES.

The simple high-pressure consolidation engine, No. 107, selected for the trial, is a Baldwin locomotive of recent design, with ample boiler capacity, 20 × 24-inch cylinders and 48-inch drivers. This engine has just been thoroughly overhauled in the Mexican City shops and was in perfect condition when the test was made.

The compound engine, No. 66, was originally a Roger consolidation, built in 1882, with 20 × 24-inch cylinders and 50-inch drivers, weighing 82,000 pounds on the drivers, fire-box inside of frames and only 6 feet long. This engine was so inefficient it was decided when taken out of service for general repairs to let it lie outside and await its chances of occupying a pit in the shops, which were always crowded with work upon more useful engines.

In August, 1889, the advisability of trying the compound principle on this road was discussed by the general manager and superintendent of motive power department with the view of ascertaining what saving could be effected in the consumption of fuel, which is the heaviest item of expense in the operation of railroads in this country. It was decided to make the change on this Roger consolidation engine. This work was not allowed to interfere with the regular work of the shops, but was carried on from time to time as circumstances would admit, so that it was just about twelve months from the commencement of the work to its completion. As it was necessary to put in a new fire-box, it was decided to increase its length to 9 feet 4 inches. The engine was stripped and the boiler work done outside, while the patterns and castings were being made for the compound cylinders.

The principle adopted by the superintendent of motive power, Mr. F. W. Johnstone, will be readily understood by referring to figure 1. It will be seen that the high-pressure cylinder, which is 14 inches diameter by 24 inches stroke, is placed within the low pressure cylinder, which is 30¼ inches diameter by 24 inches stroke, or equal to a cylinder of 24¼ inches diameter after deducting area of horse-power cylinder and the sleeve surrounding it. The ratio of the cylinders is three to one.

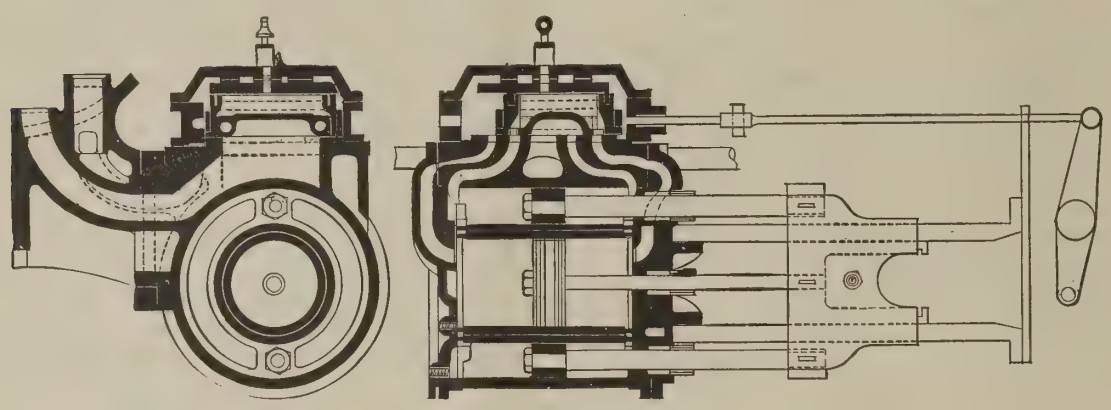
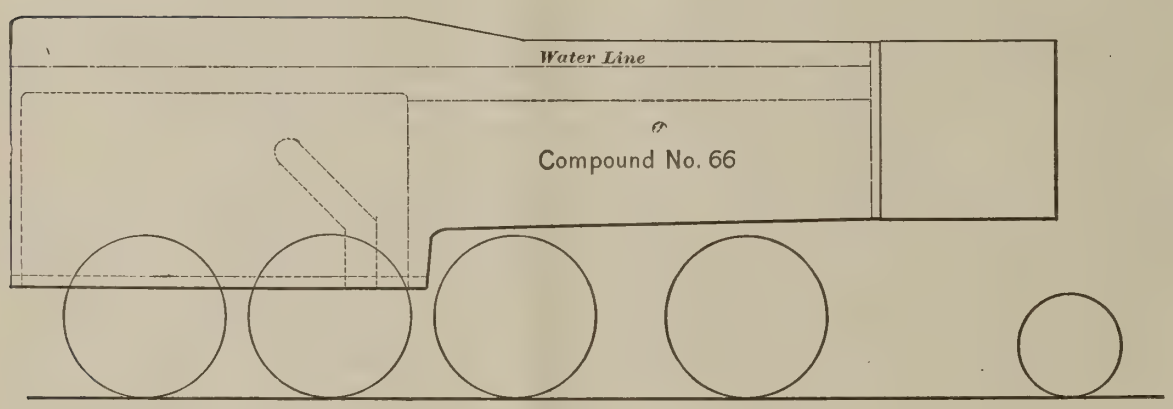
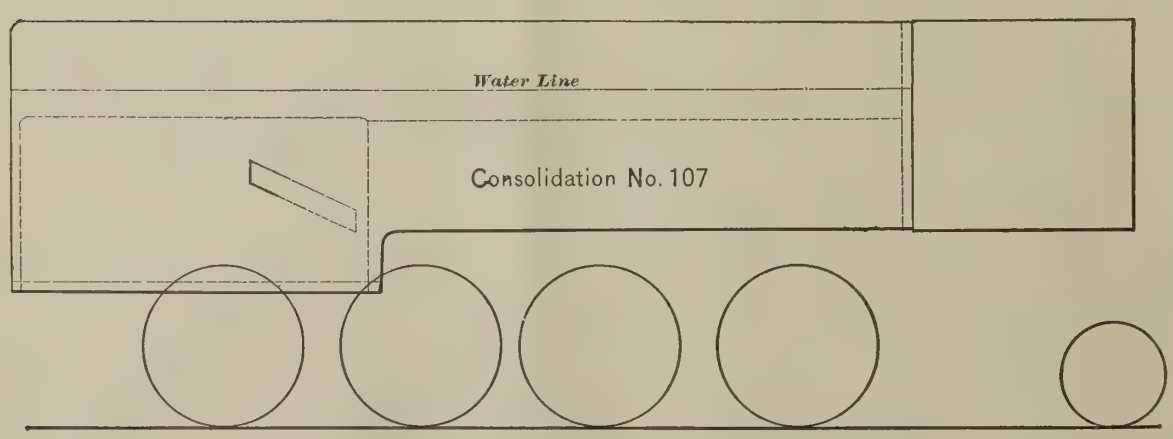


FIG. 1.





The low-pressure piston is provided with two rods and the high-pressure with one; the three rods are secured to the same cross-head, both pistons acting in the same direction.

The valve, which is a very important feature of this design, is so constructed as to distribute steam to both high and low-pressure cylinders, requiring but one valve stem, which is actuated by the link motion, as formerly used on the locomotive, no change having been made in it.

The valve is made in two sections, the outer portion distributing steam to the high-pressure cylinder and the inner section to the low-pressure cylinder. The inner section is carried by the outer, and has one inch less travel, the outer traveling six inches and the inner traveling five inches. The object of this is to retard the point of cut-off to the low-pressure cylinder and also to reduce the compression on front of the high-pressure piston. By reference to the indicator cards it will be seen that this has been accomplished in a very satisfactory manner.

For instance, when the horse-power admission is cut off at 9 inches, the low-pressure continues open to the admission of steam for 17 inches. On the other hand, the compression on the high-pressure piston, which would begin at 9 inches piston travel were both sections of valve made to move together with the same point of cut-off, does not take place until 17 inches in the high-pressure piston and 19 inches in the low-pressure. With 14 inches cut-off in the high-pressure cylinder we get 20 inches cut-off in the low-pressure cylinder; compression beginning at 20 inches in the high-pressure and 22 inches in the low-pressure.

A simple arrangement of starting valves enables the engineman to throw the engine into high pressure, steam being admitted through a reduced opening into the low-pressure cylinders; when this is done the high-pressure piston is put into equilibrium, but the two low-pressure pistons act with a force equal to two 24¼-inch pistons; therefore, the engine has a much larger starting power than any high-pressure locomotive of ordinary build.

THE TESTS.

The tests were carefully conducted by Mr. E. V. Sedgwick, master mechanic of the San Luis Potosi Division, assisted by Mr. J. H. Ebert, travelling engineer.

The crew in charge of engine No. 107 were Messrs. W. H. Spicer, engineer, and N. Campos, fireman. The compound engine No. 66 was under the charge of Messrs. George B. Ridgely, engineer, and G. A. Daily, fireman. These crews were selected for their ability in getting good work out of their engines, and had been handling these engines for two months before the trial began.

It was decided to keep the record of trips between San Juan del Rio and Mexico City, as it was always possible to get full trains out of the former place, and these trains generally came through without breaking bulk.

The trains were weighed on track scales after having been made up, and just before starting. A coal car was fitted up with platform in the center, provided with platform scales; this car was coupled to back of tank, and all coal put upon the tender was weighed in boxes and taken up an incline, formed by two planks reaching from platform on coal car to back of tender. The coal car was hauled on each train, as it was desirable to keep a record of the performances of engines on the continuous grade from San Juan del Rio to Cazadero, as well as a record of the performance over the entire division.

While the engine was standing in the engine-house at San Juan del Rio steam was kept up with wood, the tender was emptied of all coal, and a quantity thought to be sufficient to take the train to Cazadero was weighed and placed upon it. The boiler was given a half glass of water and fire was made up with coal which had been weighed out to engine. This was generally done about thirty minutes before starting out with train. If the coal weighed out to the engine was not sufficient to take the train to Cazadero, more coal was put upon the tender while running, and any coal remaining on the tank after reaching Cazadero was weighed and the amount deducted from the total. The same was done upon arrival at Mexico.

The quantities of water used was arrived at in the following manner: A glass tube 5 feet long was placed on each side of the tank, centrally, fore and aft, and connected to the bottom of tank by pipes and suitable stuffing boxes to make joint at bottom of glass tubes, the upper end being left open. These tubes were protected by brass pipes, with slots cut nearly their entire length to admit of water-level in glass tubes being seen. The tank was filled with water and the level shown in the two glass tubes was marked O, on the brass pipes; water was then drawn off into a barrel which had been carefully weighed, precaution having been taken to fill the barrel and let it soak over night to insure getting weight of the empty barrel correctly. The barrel was placed upon scales and filled until it contained 333⅓ pounds of water, then gauged at water line. Therefore, in measuring the tanks every three barrels of water drawn represented 1,000 pounds, and the level in glass tubes noted and marked accordingly, for each 1,000 pounds drawn from the tank.

Before starting fire with coal at San Juan del Rio the water in the boiler was regulated to half glass and the height of the water in the tank noted, the mean of both tubes being recorded. When a water station was reached the height of water in the tender was noted before and after taking water. As the 1,000-pound marks on tubes were about two inches apart, it was an easy matter to ascertain accurately the quantity of water used between any given points. The water lost through the overflow of the injectors (Sellers Improved) was so inconsiderable it was not taken account of. On the first trip this waste water was caught and measured, and found to be so little no further effort was made to take it into account. The blow-off cocks were used as sparingly as possible, and when used no account was taken of water thus thrown away.

These engines were not favored in any way; they laid over at sidings to await other trains, and did more or less switching at various points each trip, the object being to simply keep a record of coal and water used while engines were doing their regular duty in freight service. The engineers were not interfered with, but allowed to handle the engines as they had been accustomed to do.

Indicator cards were taken from each engine merely to show the action of the valve gear and not for the purpose of attempting to arrive at the work performed by the engine for the trips, or for any given distance or space of time during the trip as the horse power developed by a locomotive is constantly varying, and cards taken but a few minutes apart show that no reliance can be placed upon this method of ascertaining the amount of work done by a locomotive over a section of road, even when the grades are quite uniform. Seeing the necessity for a more comprehensive method of arriving at the duty of a locomotive in regular service for a trip or for a month's work, the superintendent of motive power decided in the latter part of 1884 to reduce the work done by all engines in freight and passenger service to so many units of work performed.

UNIT OF WORK IN TRAIN SERVICE.

One hundred gross tons hauled one mile at a very low rate of speed over a straight and level track was taken as a unit of work. The profile of the road was carefully studied and the line reduced to an equivalent of a straight and level track (curves being compensated were left out of the calculation).

Tables were then formed to facilitate the computation of the units of work performed by each locomotive during the month. Separate tables had to be made up for passenger and freight service, as that for passenger trains was based upon a speed of 31 miles per hour, while the freight-train table was based upon 16 miles per hour. This was

necessary, as the resistance due to speed is different for the two classes of service.

In arriving at the work done all changes in the weight of trains are taken into account, and the units of work performed between any two points with a given weight of train is shown by the tables. The weight of train is taken from conductors' reports of loaded and empty cars, weight of engine and tender added. Loaded cars averaged at 24 tons and empties at 12 tons. These figures have been checked with the year's gross and net ton miles and found to be very accurate. This system has been in use on the Mexico Central Railway for the past six years and has proved most satisfactory. The performance of light engines on level divisions can be compared with that of heavy engines on the mountain divisions. The premiums given for the most economical use of fuel are determined by the units of work per ton of coal shown on performance sheet for the month.

These years of experience having established the correctness of this method, it was decided to base the performance of the engines in the tests upon the units of work performed. But to be entirely assured as to the weight of the trains, each train was weighed before starting, as stated above. The trains were composed of cars bound for Mexico, and only in a few instances was the bulk of the train broken, and when this was done a careful note was taken of this change in weight.

Table No. 2 shows two trips of each engine while using American coal. Table No. 3 shows two trips of each engine using English bituminous coal. Table No. 4 shows two trips of each engine using English patent fuel (briquettes of compressed coal). These twelve trips were made over the entire division of 118 miles. The division is very hilly, the grades varying from 1½ per cent., with no level track to speak of.

Tables Nos. 5, 6 and 7 show performance of the engines with the three kinds of coal between San Juan del Rio and Cazadero, on a continuous grade of 1½ per cent.

The results of the tests show that the compound engine No. 66 has effected an economy of 25 per cent. in fuel and from 12 to 23 per cent. in water over the consolidation engine No. 107.

By reference to table No. 1 it will be seen that the grade area, heating surface and boiler capacity, both in water and steam space, of the compound is very much less than that of engine No. 107. With these facts in view, it is very evident that by compounding engine No. 107 more than 25 per cent. economy can be effected in coal consumption.

It will be noticed that the economy in water is not as great as in coal when comparing the compound with the consolidation No. 107. This is accounted for by the fact that engine No. 107 had 68 per cent. more cubic feet of steam space and delivered much dryer steam to its cylinders. Owing to the small boiler of the compound it was impossible to work the engine very hard, on account of the quantity of water which was entrained with the steam. This was very noticeable in taking indicator cards, not so much in the low-pressure as in the high-pressure cylinders. When working hard with lever set to cut off at 18 inches and throttle wide open, it was necessary to carry the water as low in the boiler as was safe to avoid passing water over into the cylinders. No difficulty of this kind was experienced with engine 107.

Given a boiler with the capacity of that of engine No. 107, the compound would most certainly have shown an economy in water equal to that in coal, and in using less water the economy in coal would be greater than these tests have shown.

TABLE NO. 1.
LOCOMOTIVE DIMENSIONS.

Locomotives,	No. 66 Compound.	No. 107 Consolidation.
Cylinder, size	14 in. × 24 in.	20 in. × 24 in.
Ratio L. P. to H. P.	3 to 1	
Driving-wheel diameter	48	48
Number of drivers	8	8
Weight on drivers	100,000 lbs.	100,000 lbs.
Weight of engine and tank	180,000 lbs.	180,000 lbs.
Diameter of shell of boiler	52	60
Number of tubes	200	196
Size and length of tubes	2 in. × 11 ft. 7 in.	2¼ in. × 13 ft. 1 in.
Grate area, in square feet	21.5	30.4
Heating surface of firebox in square feet	148	152
Heating surface of tubes, in square feet	1,200	1,489
Total heating surface	1,348	1,641
Working boiler pressure	150	150
Water capacity of boiler, in per cent	100	118
Steam space of boiler, in per cent., with water 6 in. above crownsheet	100	168
Grate area of boilers, in per cent	100	141

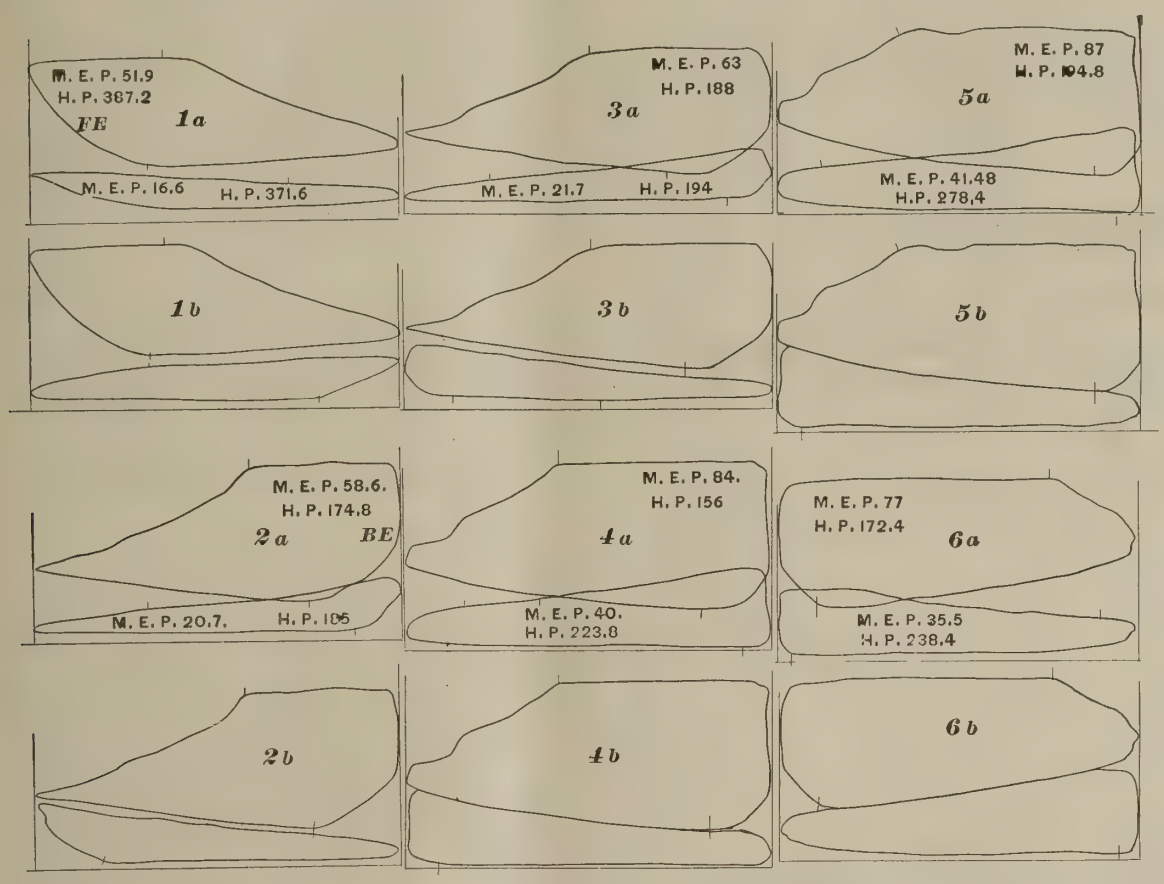


TABLE No. 2.—PERFORMANCE OF LOCOMOTIVES BETWEEN SAN JUAN DEL RIO AND MEXICO, USING BITUMINOUS COAL FROM THE MINES OF SAN ANTONIO, N. M.

	Engine 66.		Engine 107.	
Date of trips	Nov. 15, 1890.	Nov. 25, 1890.	Dec. 10, 1890.	Dec. 12, 1890.
Total hours on trip	13:20	13:40	13:13	11:35
Actual running time	10:00	10:40	9:05	7:45
Number of cars in trains	14	15	16	14
Total weight of train, including engine and tender, in tons of 2,000 pounds	494	489	483	507
Total units of work performed	1,613	1,598	1,477	1,590
Pounds of coal consumed	13,300	13,200	15,800	16,000
Pounds of water used	74,000	73,000	82,000	83,000
Units of work per ton of coal	242.6	242.1	186.9	198.7
Units of work per ton of water	43.6	43.8	36.0	38.3

Result.—Average of two trips shows the compound engine 66 doing 24 per cent. more units of work per ton coal and 18 per cent. more units of work per ton of water than engine 107.

TABLE No. 3.—PERFORMANCE OF LOCOMOTIVES BETWEEN SAN JUAN DEL RIO AND MEXICO, USING BITUMINOUS COAL.

	Engine 66.		Engine 107.	
Date of trips	Jan. 17, 1891.	Jan. 20, 1891.	Jan. 2, 1891.	Jan. 4, 1891.
Total hours on trip	15:20	11:45	9:10	10:45
Actual running time	10:00	7:30	7:20	8:40
Number of cars in train	14	14	15	15
Total weight of train, including engine and tender, in tons of 2,000 pounds	491	492	424	431
Total units of work performed	1,604	1,607	1,385	1,408
Pounds of coal consumed	12,000	12,090	12,900	13,100
Pounds of water used	69,000	70,000	73,000	74,000
Units of work per ton coal	267.3	266.0	214.7	214.9
Units of work per ton water	46.4	45.9	37.9	38.0

Result.—Average of two trips shows the compound engine No. 66 doing 24 per cent. more units of work per ton of coal and 21 per cent. more units of work per ton of water than engine No. 107.

TABLE No. 4.—PERFORMANCE OF LOCOMOTIVES BETWEEN SAN JUAN DEL RIO AND MEXICO, USING ENGLISH PATENT FUEL (BRIQUETTES OF PRESSED COAL)

	Engine 66.		Engine 107.	
Date of trips	Jan. 11, 1891.	Jan. 15, 1891.	Dec. 27, 1890.	Dec. 30, 1890.
Total hours on trip	12:02	15:25	13:00	11:05
Actual running time	10:00	9:00	7:25	8:45
Number of cars in train	15	14	16	16
Total weight of train, including engine and tender, in tons of 2,000 pounds	506	491	455	438
Total units of work performed	1,653	1,604	1,426	1,431
Pounds of coal consumed	10,800	10,700	11,900	11,800
Pounds of water used	75,000	73,000	81,000	80,000
Units of work per ton of coal	306.0	300.0	239.6	242.5
Units of work per ton of water	44.0	43.9	35.2	35.8

Result.—Average of two trips shows the compound engine No. 66 doing 25.7 per cent. more units of work per ton of coal and 24 per cent. more units of work per ton of water than engine No. 107.

TABLE No. 5.—PERFORMANCE OF ENGINES ON CONTINUOUS 1½ PER CENT. GRADE FROM SAN JUAN DEL RIO TO CAZADERO, USING COAL FROM THE MINES OF SAN ANTONIO.

	Engine 66.		Engine 107.	
Date of trips	Nov. 15, 1890.	Nov. 25, 1890.	Dec. 10, 1890.	Dec. 12, 1890.
Hours of trip	2:20	2:15	2:10	2:05
Number of cars in train	14	15	16	14
Total weight of train, including engine and tender, in tons of 2,000 pounds	494	489	483	507
Pounds of coal consumed	4,150	4,100	5,100	5,400
Pounds of water used	19,000	18,000	20,100	23,000
Pounds of water evaporated per pound of coal	4.5	4.4	3.9	4.2
Pounds of coal burned per square foot of grate surface per hour	84.8	80.0	77.5	85.4
Pounds of water evaporated per square foot of heating surface per hour	5.6	5.9	5.7	6.7
Total units of work performed	499	494	488	512
Units of work per ton coal	241	241	191	190
Units of work per ton of water	52.5	44.9	48.5	44.5

Result.—Average of two trips shows compound engine 66 doing 26 per cent. more units of work per ton of coal and 15 per cent more units of work per ton of water than engine 107.

TABLE No. 6.—PERFORMANCE OF ENGINES ON CONTINUOUS 1½ PER CENT. GRADE FROM SAN JUAN DEL RIO TO CAZADERO, USING ENGLISH BITUMINOUS COAL.

	Engine 66.		Engine 107.	
Dates of trips	Jan. 17, 1891.	Jan. 20, 1891.	Jan. 2, 1891.	Jan. 4, 1891.
Hours on trip	2:20	2:20	2:10	2:00
Number of cars in train	14	14	15	15
Total weight of train, including engine and tender, in tons of 2,000 pounds	491	492	424	431
Pounds of coal consumed	3,700	3,600	4,000	4,000
Pounds of water used	20,000	19,000	20,000	20,500
Pounds of water evaporated per pound of coal	5.4	5.2	5.0	5.1
Pounds of coal burned per square foot of grate surface per hour	73.8	71.6	60.8	65.7
Pounds of water evaporated per square foot of heating surface per hour	6.3	6.4	5.6	6.2
Total units of work performed	496	497	428	435
Units of work per ton coal	268.0	276 0	214.0	217.5
Units of work per ton water	49.6	52.3	42.8	42.4

Result.—Average of two trips shows the compound engine 66 doing 26 per cent. more units of work per ton of coal and 19 per cent. more units of work per ton of water than engine 107.

TABLE No. 7.—PERFORMANCE OF ENGINES ON CONTINUOUS 1½ PER CENT. GRADE FROM SAN JUAN DEL RIO TO CAZADERO, USING ENGLISH PATENT FUEL (BRIQUETTES OF PRESSED COAL).

	Engine 66.		Engine 107.	
Date of trips	Jan. 11, 1891.	Jan. 15, 1891.	Dec. 27, 1890.	Dec. 30, 1890.
Hours on trip	2:30	2:15	2:00	2:10
Number of cars in train	15	14	16	16
Total weight of train, including engine and tender, in tons of 2,000 pounds	506	491	455	438
Pounds of coal consumed	3,300	3,200	3,700	3,600
Pounds of water used	22,000	20,700	22,500	25,000
Pounds of water evaporated per pound of coal	6.7	6.5	6.1	5.7
Pounds of coal burned per square foot of grate surface per hour	61.3	66.2	60.6	55.0
Pounds of water evaporated per square foot of heating surface per hour	6.5	6.8	6 8	5.8
Total units of work performed	511	496	460	442
Units of work per ton of coal	309	310	249	246
Units of work per ton of water	46.4	47.9	40.8	43.1

Result.—Average of two trips shows compound engine 66 doing 25 per cent. more units of work per ton of coal and 12 per cent. more units of work per ton of water than engine 107.

The following are the leading particulars respecting the indicator diagrams taken from the locomotives:

Cards No.	Cut-off. H. P.	Cut-off. L. P.	Compression begins. H. P.	Compression begins. L. P.	Boiler pressure.	Revolutions	
1	9	16¼	16¼	19	150	200	Compound.
2	10	17½	17½	20	150	80	"
3	12	18½	18½	21¼	140	80	"
4	14	20	20	22	150	50	"
5	16	21	21	22½	150	50	"
6	18	21½	21½	23	150	60	"

The Rhode Island Locomotive Works, of Providence, R. I., recently shipped 12 locomotives from their works, three of them being for export to South America. The number included three 10-wheel locomotives, with 18 × 24-inch cylinders, 54-inch boilers and 54-inch wheels, for the Boston & Maine Railroad. The total weight of the engines loaded is 103,400 pounds, and the weight on the drivers 3,000 pounds. The three locomotives exported to South America are moguls, with 15 × 20-inch cylinders and 44-inch driving-wheels. They have 46-inch wagon-top boilers and fireboxes 66⅛ × 21⅞ inches. Three six-wheeled switching engines for New York, Providence & Boston, with 18 × 24 inch cylinders and 51-inch wheels. They have a 2,800-gallon sloping-back tank on channel-iron frames. Other orders included a mogul Forney, with 17 × 24-inch cylinders, for the International Coal Company, of Cape Breton. N. S. It has 54-inch driving-wheels and a total wheel base of 29 feet. It weighs 117,450 pounds loaded. An eight-wheel engine for the Narragansett Pier road has 17 × 24-inch cylinder, a 52-inch boiler with wagon top and 62-inch wheels.

Pitkin's New Intercepting Valve.

The annexed engravings illustrate a new form of intercepting valve for compound engines lately invented by Mr. A. J. Pitkin, superintendent of the Schenectady Locomotive Works. The essential difference between this one and the intercepting valve previously designed by Mr. Pitkin is that it is actuated by steam acting through a mechanism separate and distinct from the intercepting valve itself. It will be remembered that in the first intercepting valve referred to, the operation of opening the valve was done by the pressure of steam in the receiver acting directly upon the valve. There were certain objections to that, and the pressure in the receiver is now employed to move mechanism which opens the intercepting valve, and the closure of the valve is done by live steam also acting on separate mechanism. The principal result sought for in the invention was the production of an automatic valve for controlling the admission of live steam to the low-pressure cylinder in starting, and which could be kept absolutely tight against the leakage of live steam when the engine was working compound. This is a highly important quality for this part of a compound engine to possess, as any leakage through the valve that admits live steam to the receiver of a low-pressure cylinder reduces the saving that may be effected by the compound principle, besides abnormally increasing the power developed in the low-pressure cylinder.

No complaint was made about the working of the old intercepting valves in service, but those who are most interested in the success of the invention noticed that the leakage through the valve was considerable, which was inevitable after a little wear, since steam packing could not be used on its pistons, and the piston valve was the only means employed of shutting off admission of live steam. A source of direct inconvenience from this leakage through the intercepting valve is that it increases the back pressure on the high-pressure piston, and sometimes prevents the engine from starting easily. In the new design live steam is admitted underneath the intercepting valve in starting, pressing the valve up against the receiver ports, thereby closing the passages tight so that no live steam can leak into the receiver when the engine is starting. When the engine is working compound the live steam does not reach the intercepting valve, but is closed by a separate puppet valve.

Referring to our engravings, Fig. 1 is a vertical longitudinal section through the intercepting valve, and showing it as it stands while open; Fig. 2 is a horizontal transverse section through the intercepting valve, and showing also the auxiliary mechanism employed for operating the valve and for regulating the admission of high-pressure steam to the low-pressure cylinder. The intercepting valve *d d* is operated direct by the piston valve *l*. In both the figures the intercepting valve is shown open, with the steam passages *e e* unobstructed, and therefore in the position it occupies when the engine is working compound. When the valve is in this position there is no means for live steam to pass into the low-pressure cylinder.

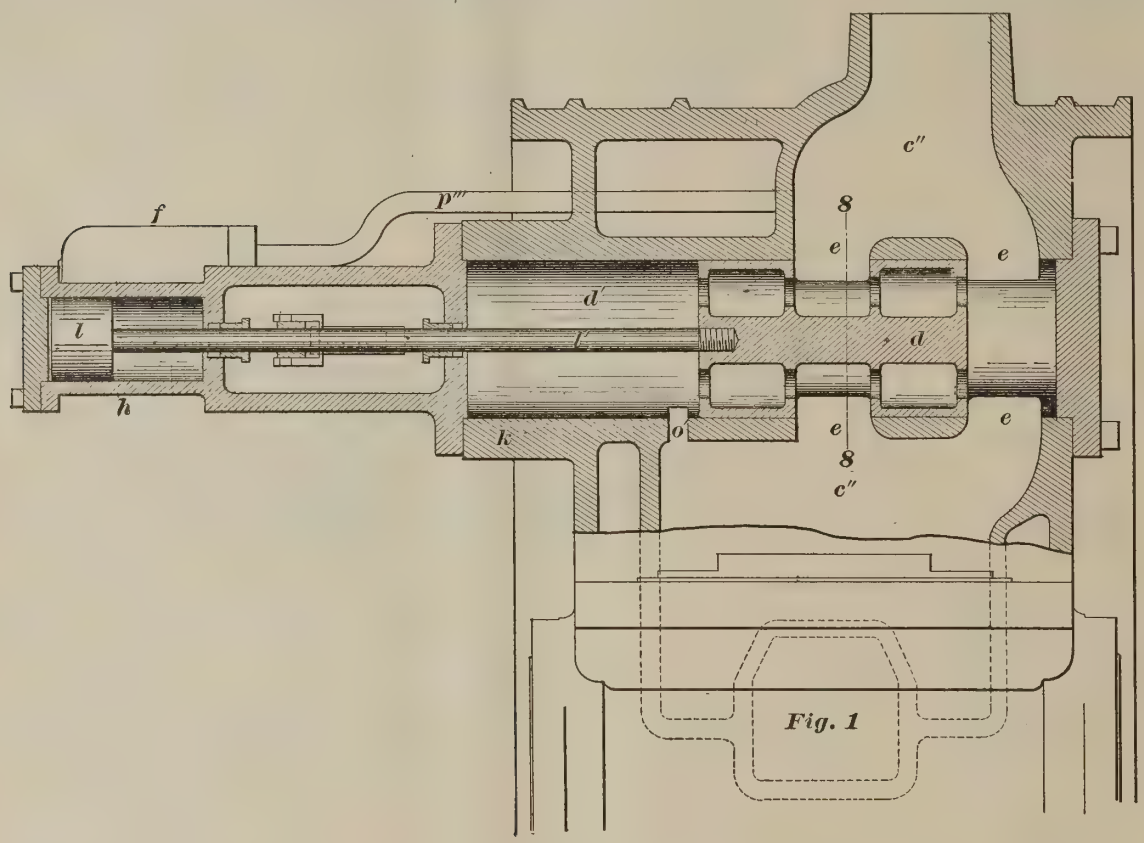


Fig. 1

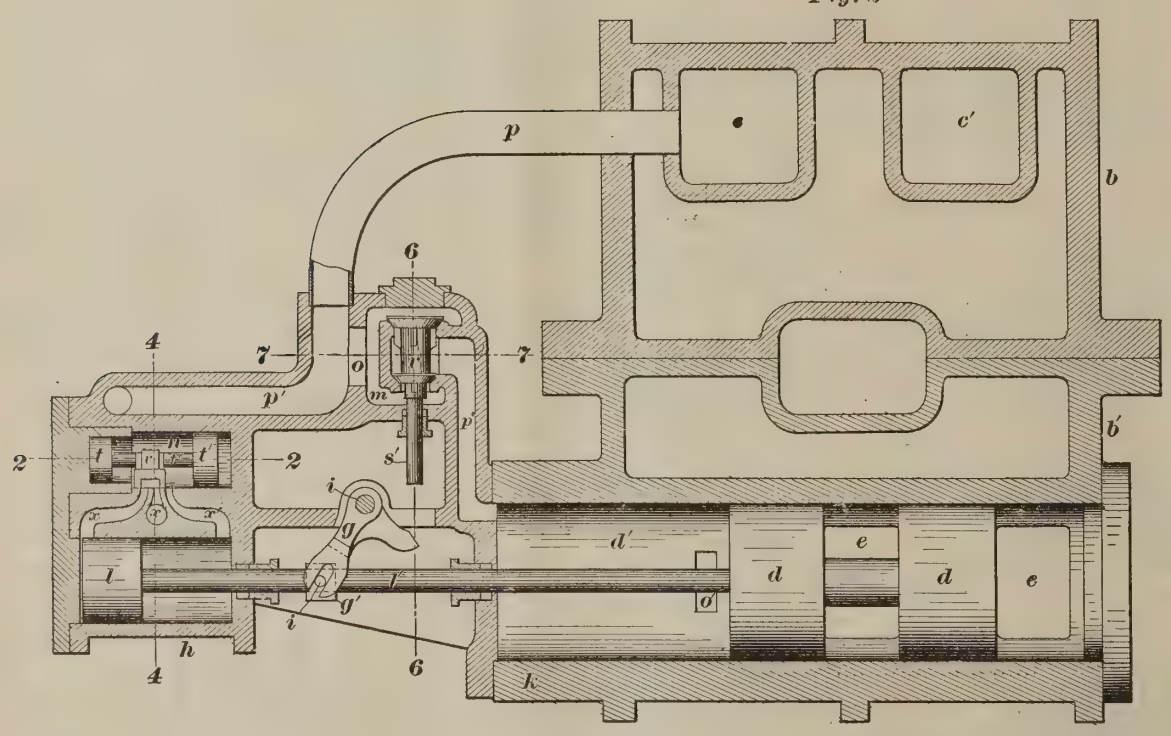


Fig. 2

In starting, the operation is as follows: The pipe *p* is connected at *c* with the steam-pipe leading from the boiler to the high-pressure steam chest. On the throttle valve being opened, steam passes through the pipe *p* into a small supplementary steam chest, which leads it into the auxiliary steam chest *n* between the pistons *t t'*. The piston *t'* in this steam chest being of greater area than the piston *t*, the valve *v* is moved to the right, opening the left port *e*. The steam passing through that port pushes the piston *l* to the right, moving in the same direction the intercepting valve *d d*, and closing the steam passages *e e*. In moving to the right, the piston rod of the intercepting valve operates the elbow lever *g*, which strikes the rod of the puppet valve *v* and admits live steam through the port *O* and passage *p'* into the cylinder *d'*, and thence through the port *o'* to the steam chest of the low-pressure cylinder. The intercepting valve, as before stated, being now closed, the tendency of the live steam is to push it up against the seat.

The changing from simple to compound working is done automatically. When a certain pressure is attained in the pipe that leads the exhaust steam from the high-pressure to the low-pressure cylinders (that is in the receiver), the steam passes through the pipe *p''''* (Fig. 1) to the supplementary valve already mentioned, and being sufficient to overcome the force exerted by the high-pressure steam on a smaller surface, moves the valve back, and opens the passage that admits steam to the right of piston head *t'* of the auxiliary valve. This is forced to the left, admitting steam to the right of the piston *l*, which is moved to the position shown in the illustrations. At the instant the intercepting valve and its connections move to the right the elbow lever *g* lets the puppet-valve *v* drop, and direct steam is cut off from the intercepting valve and the low-pressure cylinder. The actual operation is much simpler than the description. This valve is used on the Southern Pacific compounds, and acts remarkably well.

Care of Air Brakes on Freight Cars.

When the editor of this paper was preparing for the New England Railroad Club a paper on "The Inspection and Repair of Air Brakes on Freight Cars" he wrote to all the officers in charge of the rolling stock of railroads having more than one thousand freight cars, asking for their views on the care of air brakes on freight cars. As the subject is of vital interest to railroad men at present, we are certain that the gist of the replies will be read with interest and profit. Some of the letters contain matter of a confidential nature, which in every case is omitted.

Mr. E. D. Bronner, master car builder of the Michigan Central, writes:

"The subject is one of great interest and one which has caused me considerable anxiety. It should be taken up by the Master Car Builders' Association most assuredly.

"I have now air-brake plants at two points on line of the Michigan Central, and am regularly inspecting and repairing air brakes on our own cars whenever found empty.

"I think it will become necessary for us to have air-brake testing tracks and plants for some of our important interchange yards.

"I find many foreign cars equipped with air brakes which are in bad order as far as the triple and cylinder are concerned, and evidently never having had the slack in connections taken up."

Mr. John Kirby, general master car builder of the West Shore, writes:

"This railway company has not gone into the use of air brakes on freight cars as generally as some railroad companies have; therefore I am not as well prepared to answer some of your questions as I will be in the near future. While this railway company has handled stock trains with the air brakes, the air brakes are not used generally, for the reason that not a sufficient number of locomotives have been equipped with the air to handle the stock trains, and for the other reason that not all stock cars are equipped with air. The locomotives and cars are being equipped quite rapidly now; the material is at hand at our shops to equip a large portion of our freight equipment with air. The cars coming out in 1891 from the factories will have air on. 2d. It seems to me that the same rule adopted by railroad companies in the case of air brakes on passenger-train cars will apply to freight trains. Sleeping-cars start from Chicago and run through to New York and Boston if they have the proper care at the terminals. They are simply tested whenever the locomotive is exchanged, to ascertain that they are right and in proper working order, and it should make no difference whether it be an N. Y. C. engine or a B. & A. engine that is coupled onto that train, the brakes must work properly before the train is started or hold it until they do. That same rule should be applied to freight trains equipped with air brakes, and the same plant can be used for both classes of service if the distance between the two yards is not too great. It will be much cheaper and more available to put an air pump and reservoir onto a switching engine than to establish a plant in a freight yard at interchange points.

Mr. Charles Coller, master car builder, Louisville, New Albany & Chicago, writes:

"I think it would be both practicable and advisable to put in plant for testing air brakes at important interchange points. Pipes could be put under ground between the tracks or overhead, with suitable hose connections at different points leading to storage drums filled with air. I think that rules in the near future will have to be formulated for the inspection of air brakes."

Mr. E. B. Wall, superintendent of the Pittsburgh, Chicago & St. Louis, sent a very comprehensive book of instructions used by his company regarding air brakes and wrote:

"You will perceive that we require that air brakes shall be tested on each train before it starts out on its journey, and whenever another car is added equipped with the air brake. I think that every repair shop should be furnished with plants for the purpose of testing air brakes, but I do not think that they would be practicable, or necessary, at interchange yards. At the latter points, instructions should be put in force that before trains are started the brakes should be tested.

"I do not think it would be advantageous for the Master Car Builders' Association to formulate rules relative to the inspection of air brakes, at least at the present time. I think this is a matter for each road to attend to."

Mr. G. W. Rhodes, superintendent motive power, Chicago, Burlington & Quincy, writes:

"I think the subject you have to report on is quite an important one, and one which up to the present time is rather being neglected. It is a fact that some of the air-brake cars that are now running are in anything but good condition. Not very long ago at a Western point on our line where sixteen private stock cars were offered us there were only eight of them that had their brakes in working condition; all the rest had to be cut out. Those who are advocating the more rapid introduction of safety appliances on trains had better not lose sight of the fact that their introduction should not be more rapid than the railroad companies' facilities for taking care of them justify. If this is lost sight of it will be disastrous, as we will get into service appliances which are expected to do certain things, which they will not do on account of their inefficient condition. Just how practicable it would be to place appliances for testing air brakes at all important interchange yards I am not quite clear. At certain points convenient to shops it certainly is practicable. We have now in our principal repair yards such appliances. Chicago passenger yard is equipped for testing air brakes. Western avenue freight repair yard is also so equipped. Aurora repair yard, Burlington repair yard, Creston repair yard—these yards, however, are all close to the shops, where we have live steam and can pipe the air conveniently to the yard.

"I don't think there need be any change in the rules in regard to the inspection of air brakes. If anything is missing we now require, the delivering road to make it good or give a card for it. To know whether the brakes are in good

order or not is a matter that the receiving road must look after in the same way that it looks after the journal oiling."

Mr. E. S. Marshall, general master mechanic of the St. Louis, Arkansas & Texas, writes:

"I am fully satisfied that there ought to be a provision made at interchange points to test the air brakes on cars, so that trainmen might know before starting what cars could be relied upon in helping to stop the train. I have in my shop at this point a rack upon which we set up and test all air-brake pumps; and, seeing the necessity of testing the air apparatus on cars, I had a pipe run from the shop down into the yard, and have a succession of boxes sunk in the ground, three way cocks on all along the track upon which air-brake cars stand. For this purpose I furnish a hose about 20 feet long, with regular air brake coupling on one end. This is attached to the coupling on cars and brakes tested in this manner. Where this would not be practicable, I would suggest that one or more switch engines at a terminal point be equipped with air for the purpose of making this test.

"I am not, at this time, fully prepared to offer anything in regard to new rules in regard to the inspection of air brakes. One item, however, that I would like to see impressed on all inspectors is the importance of hanging up all hose that is not being used, onto the regular bracket provided for that purpose. We know the importance of this, and we see daily cars running that the hose hangs down, thereby filling cylinder and triple valve with dirt and cinders, to the great detriment of the usefulness of the brake."

Mr. Thomas Sutherland, assistant mechanical superintendent of the Chicago & Grand Trunk, writes:

"At our yards at Elsdon we have a pump and pipes laid through the yards and test our hog cars in this way, which I think is the best. Our cars loaded up with cattle at the Union Stock Yards are tested by the yard engines, they being all supplied with air. I do think it would be quite practicable to put in plants for testing air brakes at important interchange yards; it would be at a good deal of cost, which would be the main drawback.

"As to your question, Do you think new rules should be formulated by the M. C. B. Association respecting the inspection of air brakes? No, sir—I do not. I find that instead of the M. C. B. Rules being lived up to and taken as a guide, they are only a side issue now. Every master car builder has his own views, and issues his circulars to no end accordingly. No, sir; let every road do as they see fit; they will do that anyway. I will take good care of my road; let my neighbor do the same in his own way. I think this is not the best way. I am quite sure it is not. But I do not believe in our putting ourselves into hot water, by making rules which will not be lived up to."

Captain Wade, superintendent of motive power of the Richmond & Danville, writes:

"I agree with you that there ought to be a provision made at interchange points to test air-brake cars; but until the use of air brakes is much more general than at present I do not believe it will be possible to induce railroad companies to go to the expense of putting up plants for testing air brakes at every interchange point and the additional expense of getting cars in position and testing.

"As the use of the air brake becomes more extended, some provision for tests at interchange points will be found indispensable.

"I think it would be a very good plan for the Master Car Builders' Association to formulate rules regarding the inspection of air brakes. I am not prepared at present, however, to make any suggestion as to such rules. Probably if a rough draft of such rules could be gotten up by a committee, the discussion that they would bring forth at the meeting of the association would result in valuable information, and the information obtained by such discussion would enable a special committee to formulate rules that would be acceptable."

Mr. F. A. Chase, master mechanic of the Kansas City, St. Joseph & Council Bluffs, writes:

"It does not appear to me that there are enough air-brake freight cars in the West at the present time, as compared with those that have not got air, to pay for putting in plants at important interchange yards for testing air brakes. There may be, however, a larger per cent. of freight cars equipped with air brakes in the East, so that it would pay to do it there.

"Second, I do not think that the time has arrived when it would be advisable for the Master Car Builders' Association to formulate new rules for inspection of air brakes. It appears to me that under the existing circumstances the inspection as to air brakes is as satisfactory as it is to other parts of cars."

Mr. C. A. Schroyer, superintendent car department of the Chicago & Northwestern, writes:

"In our experience we have met with considerable difficulty in the inspection and maintenance of our air brakes, the greatest of which has been in the fact that the connecting rods were light, the jaw irons were all thin and the pivotal pins were all small, which necessarily caused expansion in the irons and shearing of the pivots, and a wearing of the holes in the thin iron of the jaws. This we are preventing by increasing the size of the irons used, and as far as possible have adopted the Master Car Builders' sizes for this purpose. Having established this much, we think we have reduced the difficulty of the stretching and the wearing of our parts to a minimum, hence but little trouble should be caused in this direction.

"As regards the establishing of plants at interchange points for the testing of air brakes, with us this would not be practicable. The conditions of our road, as you know, are such that all cars in our service fitted with air brakes reach Chicago, our central point, probably as often as three to a half a dozen times a year, where we can fit up plants for the testing of our air brake apparatus. In the old practice we were compelled to have an air-brake application to determine what the piston travel in our cylinders was. We have moved in the direction of the construction of a device for measuring this travel automatically, and to that end have invented what is known as the Schroyer-Thompson Piston Travel Indicator, which will, I think, reduce the difficulty in determining the proper amount of piston travel on freight cars. With central stations as we could have them in our service, and the use of the piston travel indicator whereby the adjustment could be taken up at any point along the road, I think that our difficulty in handling air brakes will be reduced to a minimum.

"On the Peninsula Division, where we are using air brakes in freight car service to the greatest extent, our practice has been to have at Escanaba, where all trains centre and all of our equipment passes every few weeks at least, our force of air brake men, who there make the adjustment and the replacement of worn parts as they are needed. We have about 2,100 heavy ore cars running with air brakes, and during the summer season we have three or four men there looking after them constantly. I think that the introduction and the increase in the freight car air brake equipment will in time point out the methods which we must necessarily pursue in maintaining them."

Mr. A. Vail, general master mechanic of the Western New York & Pennsylvania, writes:

"In our judgment it would not be practicable to maintain plants for testing air brakes at all important interchange points, owing to the different points in large yards at which trains are made up and the time it would take to get freight trains in position for testing the air brakes; also I cannot now see that it would be necessary for the Master Car Builders' Association to formulate new rules respecting the inspection of air brakes, at least for the present. Quite likely when air brakes on freight cars become more universal on all roads, new rules will have to be formulated to govern the inspection of air brakes."

Mr. Herbert Wallis, mechanical superintendent of the Grand Trunk, writes:

"If in regard to the extensive working of brakes on freight trains a plant is found necessary, it seems to me it should be of a very portable character, because it would be almost impossible to pipe a large freight yard to afford the necessary permanent requirements unless at a very large expense.

"Our system in regard to the fixtures of passenger cars is to examine the triple valves and pistons every three months—the date of examination being chalked upon the air reservoir. If this should be adopted as a system for freight train brakes I do not see that there would be any need of a further test."

Mr. J. R. Groves, superintendent of rolling stock of the St. Louis & San Francisco, writes:

"As the matter now stands, I very much doubt the wisdom of expenditures for a plant for the special purpose of inspecting air brakes on freight cars at interchange points, as there are but very few roads who use air brakes on their freight equipment. Again, the fact that interchange yards are generally too small for the purpose of interchanging cars only, and that there is no time for either repairing cars or testing brakes in such yards, would cut quite an important figure. I think the best method at the present time would be the thorough test of air brakes in trains when they were made up, either by switching engines under the supervision of the car inspectors, or by the regular train engine under the supervision of the car inspectors and train crew."

Mr. R. C. Blackall, superintendent of machinery of the Delaware & Hudson Canal, writes:

"We have no freight car air brake on the cars of this company. I think, however, the inspection of air brakes at terminal points should be as effective as it is for passenger trains."

Mr. Pulaski Leeds, superintendent of machinery of the Louisville & Nashville, writes:

"I think there should be not only inspection, but a thorough test of all air brakes after the train is made up, or, what would be better, both before and after. If all trains on arrival in yard were tested all failures could be noted and proper repairs made on repair track where men were safe. At New Orleans I have fitted up the train shed so as to test all passenger equipment, having pipes the length of shed, one length serving for two tracks; at every 50 feet we have a connection, so we can test each coach separately, or a train together, using about a 20-foot length of hose. This could be easily applied in any yard if they would always make up trains on regular tracks, and in any yard where the proper system prevails of having all trains inspected before they are cut up for switching. It could easily and cheaply be applied, as all trains should be received on an incoming track or tracks; but I am of the opinion that we will have to depend on the air from a switch engine *when you can get her*, although I believe it would pay any company to have one engine and crew at all large points to test air brakes and handle cars for the mechanical department only, as air brakes are a delusion and a snare unless kept in good order. I am putting air on all engines as fast as practicable, and have asked the transportation department to put all cars equipped with air next to the engine, and to have it used to as great an extent as possible, and I find we do not have as many hose and fittings cut off as we used to.

"Your opinion that provision should be made for testing is absolutely correct, and a plant is practicable, and the question in my mind is, Shall it be stationary or portable? How would a little dummy on a 30-inch track between an incoming and outgoing track do? Of course a stationary plant for entire trains should be compact, as you do not care which end you couple on, and one end of all trains could be placed at one point."

Mr. W. Cormack, master car builder of the W sconsin Central, writes:

"As nearly all roads are using air brakes on freight cars, more or less, and as the trainmen and engineers depend on the air to control the speed of their trains, and the trainmen held responsible for the same, then why should the air brakes not be tested so that both engineers and trainmen could know the condition of their brakes and what they have to depend on?

"No roads running passenger trains will allow their coaches to leave a terminal point until the air equipment has been inspected, and in case of any of the brakes not being in perfect order, the air is either cut out or the necessary repairs made. In the most of yards where trains are made up a competent air brake inspector should be kept on hand to make the proper inspection whether the tests are made from the locomotives or from any other appliances that may be in use.

"It would be perhaps a hard matter to have plants put in at all yards where trains are made up, but in a good many yards a plant could be very easily put in to test all freight cars, the same as there is in a good many coach yards in Chicago and other places where the air can be tested on any car at any time. The manner of testing the air with the locomotive after it is coupled onto the train does not do the brakes justice in a good many cases, and allows no chance for any repair work to be done to any part of the air equipment.

"So I would say a plant with a small engine and air-pump would be most serviceable; then no excuse could be made for not making the proper tests of brakes on all cars equipped with air. I think new rules should be formulated by the M. C. B. Association on this inspection of air-brake, and it will, no doubt, be debated on at the clubs for the next three months.

"I do not know what would be a proper rule to cover all the points that would be required. No doubt but at a great many places one plant would do for a number of roads, in which case a joint air inspector could be kept."

Mr. James M. Boon, assistant superintendent of the West Shore, writes:

"I do not think it would be practicable to have a plant at interchange points for the testing of air brakes on freight cars, for this reason: Junction points are generally very badly crowded and the use of the air brake is not 'universal;' a train may come to an interchange point composed of air brake and cars with ordinary hand brakes. In this event it would be necessary to switch the air-brake cars together in order to get them at a point where they could be tested. To attempt to test each air-brake car, scattered over a large yard, would be an endless job and require too great an increase of yard facilities.

"The rule in force on the West Shore road is, all air-brake cars are switched next to the engine (when an air-brake engine is to take the train), the brakes tested before the train leaves and all the train crew fully posted as to the condition of the brakes that they may know just how much braking power they have to depend on while making the trip.

"Again: At inspection points the air brakes are applied and examined by the men who inspect the train. The trainmen are also expected to notify the inspectors of any defect that may have developed from the starting until the arrival of the train at an inspection point. At Weehawken and Buffalo, the termini of the road, there is an air-brake inspector stationed, whose duty is to inspect air brakes on all cars in the yard before being made up into trains. These men are also notified of any defective brakes discovered on an incoming train, which are sent to the testing plant and put in good order before being sent out again.

"The air brakes should be inspected at terminal points by inspectors the same as any other part of the car and refused for any defect, which should be made good by the road delivering the car. On account of trains being run 'mixed,' as above mentioned, it may be premature to attempt to formulate or enforce a rule of this kind at the present, but as the number of air-brake cars increases it will be necessary to do so in order to protect the accepting road and also to facilitate the repairs of the cars. The road delivering cars in a solid air-brake train, may test the brake before the engine is cut loose and locate any that need attention."

Mr. Ross Kells, superintendent of motive power of the Erie, sent an excellent book of instruction in relation to brakes and blue print of an instruction plant, and wrote:

"We have no plant at any of our termini for inspection of air brakes; it is done by a regular road or yard engine having an air brake attached to it. I do not think it practicable to put plant up specially for this purpose, but do think that all yard engines should be equipped with the air brake. I also am of the opinion that rules should be formulated by the Master Car Builders' Association respecting the inspection of air brakes and fixtures. I also think that the travel of the piston rod on the brake cylinder should be watched very closely and kept within the limit prescribed by the rules, and that the brakes should not be tested with the emergency brake, for the reason that it strains all parts to their fullest capacity, and the result is that the inspectors would shorten up the rods, and when the brake is released the brake shoes would be dragging on the wheels. The emergency brake should not be used under any circumstances except in cases of emergency.

"It should be the duty of the trainmen bringing in a freight car equipped with air brake and out of order to report such fact to the chief inspector on his arrival, as it would afford the inspector an opportunity to put the brake in condition before testing it with the regular engine."

Mr. John Player, superintendent of machinery of the Atchison, Topeka & Santa Fé, writes:

"I think where switch engines are equipped with air brakes, as on our road, and used as we use them, namely, when making up train to test air on train with switch engines, is about all that is necessary if the air brake inspector is on hand to see that brakes are in proper working order. This we try to do at all times, and our time card rules require that trainmen (engine men included) must know before leaving a station the condition of brakes, so it would not appear necessary to have a testing apparatus at interchange points.

"In our repair yards it is a good thing, and there should be in every repair yard of any extent an air brake apparatus with pipe line and connections throughout, extending the length of yard between two tracks, where cars overhauled can be tested before being put into service. This we do, but at present I think no rule can be formulated that will add in any way to interchange with any more rapidity than at present.

"When all roads learn and are willing to admit the value of air brakes on freight epuipment, and apply it on their cars, it may become necessary to place some air brake testing apparatus at interchange points; but, judging from the number of non-air cars that pass over the A., T. & S. F., that we have to pipe and then remove pipe at the end of the trip, I fear that part of the millennium is a long way off."

Mr. Wm. Garstang, superintendent motive power of the Chesapeake & Ohio, writes:

"I do not see how railroad companies could provide or make suitable provisions at large interchange points for testing the air brake of freight cars. To do this, in my opinion, would require a system of air brake pipes between each track. I think the only method of testing these brakes successfully will be to use the same practice that is now in vogue with the passenger department, *i. e.*, testing the air-brakes with the locomotive that is going to take the train forward; but do think there ought to be new rules formulated covering the maintenance of the air brake apparatus in the way of oiling and examining triple valves, etc., the expense of doing this to be charged to the owners of the car; and to do this there ought to be a set of rules governing same and an established price made, and some means adopted whereby the owners of cars would know that they are receiving the same attention they would have on their own line. This subject is comparatively a new one, and I do not know that I can say anything further about it that would be of any interest or advantage at the present time, but think it a very important question, and that it should be agitated as muchas possible.

An Original Way of Making Friends.

"McKibben was all right when you knew just how to manage him," said a stalwart drummer, in the railroad-supply business, yesterday, as he abstracted from the box a handful of the Henry Clay's for which this office is justly famed.

The scribe had received the impression that during his brief but pyrotechnic career the purchasing agent referred to was noted for his bucking proclivities.

"Well, yes," said the drummer, "he was skittish, but there is a way of managing these cattle. Did I ever tell you how I first made a start with McKibben? No?

"For the first few months after he took hold I could do nothing with him, but when I was in the West I called regularly to ask for an order. One day I sat in the row of the outside office for two hours waiting patiently to see the Grand Mogul, while favored men repeatedly passed in ahead of me. At last Mc. came out, and in a very surly voice said, 'What the blank do you want?' I answered, 'In the first place, I want to be treated civilly, and you would not dare to talk to me in that style outside, if you are a bigger man than I am.'

"At this Mc flared up and ordered me, with many oaths, to get out of there, and walked up as if he intended helping my exit. I jumped at him, and, grabbing him by the throat, gave him a few twists, and then invited him to come out into the hall. His demeanor changed instantly, and he said, 'What's the matter with you, anyhow? I was only trying to have some fun with you. Come inside.'

"I went inside, and I never was better treated by any purchasing agent. I got a good order for goods from him, and the orders were kept up as long as he remained on the road."

This is an absolutely true story, and has no connection with the Boston Ananias Club.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

BRAKE STANDARDS AND CARE OF AIR BRAKES.

The most important subject that will occupy the attention of the Master Car Builders' Association at the coming convention is "Air-Brake Standards and Care of Air Brakes on Freight Cars." It is difficult to say what may be recommended in the line of standards, but there is likely to be little difference in opinion as to the necessity for maintaining the brake in working order on every road where cars run that are equipped with air brakes. The extracts from numerous letters on this subject that we publish in this issue, show that the sentiments of nearly all heads of car departments recognize the duty resting upon railroad men in this matter, and rules will doubtless be formulated requiring the work to be attended to systematically. There are few railroad companies now that do not have air brakes on their switch engines, so that no great difficulty or expense will be incurred in requiring a road that delivers air-brake cars to see that the brakes are in working order. The educational effect of rules requiring air brakes to be delivered in working order will be very powerful for good, and will impress men with a sense of duty on the subject whose minds cannot be reached in any other way. A few will resent the action of the majority and call it unjust, but they will all quickly come to recognize that the action was wise and prudent, just as others soon came to acknoweldge the wisdom of similar action in regard to passenger cars intended for through travel. It is high time that the educational influence of rules respecting the condition of air brakes on freight cars was felt, for the condition of air brakes on many cars is simply disgraceful. It is quite common to find trains braked by hand that have air-brake cars sufficient to do the work, but are not used because so many of the brakes are out of order. It is also quite a common thing to find stock trains that are to be run first delayed at the starting point till sufficient brakes to hold the train are put in working order.

The Master Car Builders' Association has done more in establishing standards of brake gear than it has done in regard to any other part of the car equipment, and the brake would be all that could be desired if the standards were only used. The Christie brake shoe is standard, and, if the requirements of the Association were complied with the shoe would not be put on a beam that was not capable of standing a pressure of 15,000 pounds with a deflection of one-sixteenth inch if the beam was connected with an air cylinder. This means that an iron or steel beam must be used, an improvement that moves along very slowly. It is surprising the persistency with which some railroad companies cling to the old weak wooden brake beam. They brace and stay it enough to raise the cost to that of a good steel beam, and yet it remains a weak combination of many parts that are always shaking asunder and keeping up the expense of repairs. The weak foundation brakes that are still turned out of builders' shops with air-brake connections indicate, that a great many of our master car builders do not remember that the standards of the Association and common-sense require that all levers shall be one inch thick, all pins turned to $1\frac{7}{64}$ inch diameter, all jaws or clevises made of $\frac{3}{4}$ by $2\frac{1}{2}$ inch iron, and that all rods be three-quarters of an inch thick. If these particulars were put in all specifications for new cars, the first cost of the cars would not be a cent higher than where they are omitted, and a brake would be obtained capable of resisting without deflection the strains of the air piston. We do not believe that the majority of the Master Car Builders' Association would be inflicting any hardship upon railroad companies, if they required cars equipped with air brakes to have a foundation brake constructed according to the standards of the Association.

PUNISHMENT BEFORE TRIAL.

Readers of ancient Scottish lore are aware that in the old border town of Jedburgh it was the custom when the representatives of law and order got hold of certain reputed malefactors to hang them first and then try them afterward. This is known to history as Jeddart justice. The criminals probably got their deserts and a little more under that drastic code, and the people were not annoyed with lawyers' schemes for defeating justice; but the practice has never been popular outside of Scotland, and we do not think that any other community has followed it. Although no modern community has gone to the extent of hanging their criminals as a regular practice before trial, it appears to us that the switchmen of American railroads in their disputes with their employers have imitated the Jeddart plan very closely. When an employer of labor gives cause for workmen to feel aggrieved or offended, the latter usually tell what they have to complain about and strive to have it remedied before they take aggressive fighting measures; when the switchmen have a grievance, real or imaginary, they strike without warning, and then, when they have done all the harm they can to the company that has been giving them the means of living, they try to make known what they have been quarreling about. To their credit, the officers of the Switchmen's Brotherhood have done all in their power to restrain this habit of their constituents; but the practice is still so common that it may be regarded as the switchmen's method of settling disputes.

The switchmen belonging to the Chicago & Northwestern Railroad have lately brought their method into national prominence. In the yards at Chicago the switching for the main line and for the Wisconsin division is all done under one yardmaster, but there are separate switchmen for doing the work of the different divisions. Two months ago Frank McInerny, who was yardmaster, requested Foreman Crow, of the Wisconsin division, to put an extra coach on a main-line train. Crow refused to do so, and used the foulest language at his command toward the yardmaster, for which he was discharged. The switchmen promptly struck work and prostrated the traffic of the yards and stopped the moving of the numerous suburban trains. After this damage had been inflicted upon the railroad company and the traveling public, the men explained that they wanted the discharge of McInerny and the appointment of Crow in his place. That they might resume the running of trains, the railway company yielded to the demands of their switchmen, and the man who originated the trouble took charge of the yards.

It turned out that the switchmen overreached themselves in this instance, for McInerny was a member of the Conductors' Brotherhood and therefore a unit of the Federeration of Trainmen. He appealed to his Brotherhood for redress against the switchmen, and the Federation made his case their own. The case was very carefully and deliberately considered by the Federation council, and they finally decided that it was the duty of their order to demand redress for the ill-used yardmaster. It may be presumed that the officers of the Chicago & Northwestern Railroad were not sorry when they received intimation that the Federation requested the reinstatement of McInerny and that the organization was prepared to support the company in case of trouble with the switchmen. The result was that the Chicago & Northwestern discharged at one sweep Crow and all his supporters and with them all the union switchmen in the employ of the company. New men took the places of those who were discharged, and there was very little inconvenience experienced through the sudden change of men.

JOHNSTONE'S COMPOUND LOCOMOTIVE.

The progress that the compounding of locomotives is making on this continent receives a new illustration in the account in another part of this paper of the tests of a compound locomotive designed by Mr. F. W. Johnstone, mechanical superintendent of the Mexican Central Railroad, and built under his supervision in the shops at the City of Mexico. The arrangement of the cylinders has the merit of novelty at least. The engine is of the consolidation type, and the high-pressure cylinder is inside the low pressure cylinder, making a concentric arrangement. The piston areas employed are 154 square inches for the high-pressure and 462 in the low-pressure, a ratio of 1 : 3. This is a considerably higher area of L. P. area than the current practice. The design appears to be remarkably well worked out mechanically, but we cannot express any admiration for the plan adopted. By reference to our illustration of the cylinders it will be seen that the low-pressure piston is connected by two rods to the crosshead that transmits the power from the high-pressure piston. The valves that distribute the steam to both cylinders are actuated by one valve stem, the high-pressure valve spanning and actuating the low-pressure valve which is beneath it. The inside valve is loose on the seat, and has one inch less travel than the outer valve. The object of this arrangement is to retard the cut-off of the steam in the low-pressure cylinder beyond the point of cut-off chosen for the high-pressure cylinder. Power for starting is obtained by admitting reduced high-pressure steam to the low-pressure cylinder, and putting the high-pressure cylinder in equilibrium. This engine was subjected to a series of comparative trials in heavy freight service against a simple consolidation engine of substantially the same weight and capacity, the work having been done on a hilly track. The train service performed by locomotives on the Mexican Central is all reduced by an excellent system to units of work, and the comparative tests were reckoned on the basis of this unit. The record of twelve comparative tests which we have received shows that the compound does an average of 18 per cent. more units of work per ton of water and 25 per cent. more work per ton of coal than the other engine.

The results secured were highly gratifying to all concerned, and the saving is of very great importance to the company in a country like Mexico, where fuel costs $11 a ton on the tender. The conditions of the tests appear to have been well arranged for securing a fair comparison of the performance of the two engines, and the results may be accepted as substantially correct. The service performed was of the character which we have always contended was the best adapted for showing the most economical performance of compound locomotives. A heavy freight train had to be pulled up a succession of stiff grades at a speed which admitted of a very moderate piston speed. To do the work, an ordinary simple engine would require to let the steam follow the piston at least half stroke, obtaining at the most one measure of expansion, while the compound, owing to the cylinder ratio, could not work without expanding the steam at least three times.

The locomotive has evidently done good economical service, but we nevertheless consider the design a bad one. The only advantage that the design offers over that of an ordinary two-cylinder compound is, that the power applied on both sides of the engine is equal. To secure this advantage, serious complication of parts and a very questionable form of cylinder arrangement have been resorted to. The hot high-pressure cylinder is surrounded by a low-pressure cylinder of much lower temperature, so that there must be a constant waste of steam through condensation. An annular piston operated by two piston rods is an unmechanical arrangement to say the least of it, and it calls for two sets of piston rings, with the increased liability to breakage and leakage. That plan of using an inside valve to be kicked by one above it has been repeatedly tried on American engines, and as the life of the valves was too short to make it popular in stationary practice, we are afraid it will not prove a durable arrangement in a locomotive. There has been a great deal of mechanical ingenuity displayed in working out the details of this engine, but it appears to us that less labor on a simpler form would be likely to obtain a more gratifying reward.

CIRCULATION IN LOCOMOTIVE BOILERS.

The locomotive boiler has great capacity crowded into such small space that many faults of form have to be put up with that would never be followed by a competent designer who was not curtailed by room or shape. A bad effect that results from the internal equipment of locomotive boilers being so much crowded is defective circulation, which no doubt seriously interferes in many cases with the economical use of fuel. It has been repeatedly demonstrated by experiment that any arrangement which will promote circulation will materially increase the quantity of water evaporated per pound of combustible used, but the knowledge of this fact does not appear to have influenced locomotive designers to devise the best means for inducing circulation in the boilers used. There appears to be a revival of interest in the subject at present, for we have several times lately found master mechanics scheming to work out arrangements for inducing circulation. The improvements have generally taken the form of increasing the water spaces and arranging the tubes so that they will offer the minimum resistance to the movement of steam and water.

There are very encouraging prospects of gaining decided advantages from placing the flues in vertical rows, a practice that has been adopted lately by several of the designers who have been interesting themselves in the question of improved circulation. The boiler is likely to steam more freely, and it certainly can be kept clean much easier than the boilers having the tubes set in diagonal rows. From what we have seen in laboratory experiments we are convinced that a boiler with tubes set in vertical rows will circulate the water and the surface of the tubes more

thoroughly and freely than can be done with a boiler having the tubes set so that there must always be obstruction to the upward movement of the steam. Where there is a free passage for the steam to move upward, there are separate currents kept running between the flues, the steam going upward and the water downward, a constant supply passing to the tube surface to replace the water turned into steam. When the steam has to pass to the surface of water in a zigzag course it keeps pushing against the tubes in its course driving away the water and exposing the heating surface to a mixture of steam and water that is not nearly so effective in absorbing the heat as solid water. This may appear to be a mere theory, but it is a theory founded on the observed action of the inside of experimental boilers. Water and steam do not act differently in ordinary service than they do in the trials where their action is under investigation, and the men who refuse to be guided by the teaching of such experiments are not wise in their generation.

WEAKNESS OF LAIRD CROSS-HEADS.

The Laird piston guide and cross-head has certain valuable features that have made the combination popular with locomotive builders and master mechanics, and have led to a great many locomotives being equipped with that form of guide and cross-head during the last few years. It is peculiarly well adapted to locomotives having more than two pairs of driving wheels, since it takes little room, is easily supported in compact shape, and is located away from the sand and grit that prove destructive to guides placed nearer the track. With all these good points, the Laird guide and cross-head is losing popularity, for the simple reason that, in most places, where it is in use, broken piston rods are of frequent occurrence. From nearly all roads where the Laird cross-head is in use, we hear the complaint that constant attention is necessary in taking up lost motion of the cross-head, or breakage of the piston rod is certain. There are two kinds of Laird cross-head in common use. In one pattern any binding of the rod in the forward pin is transmitted to the cross-head gibs, and tends to spring the cross-head up and down. In the other kind the binding of the pin merely turns the sleeve. The latter form of cross-head puts least stress on the piston rod, but lost motion even in this pattern if likely to produce bad results.

It might be argued that it is only good business management to see that cross-heads are not running with the loose space between them and the guides. The exigencies of railroad service often call for things being done or undone that are not for the best interests of the company, and neglecting the repairs of locomotives is common on nearly all roads when business is rushing. If any design is of a form that is peculiarly liable to cause breakage when repairs are neglected or protracted, it is not the proper thing to be used by a railroad company as the business is now conducted. Th ere is reason to believe that the Laird cross-head is one of the designs that is only satisfactory when maintained in first-class condition. Owing to the leverage which the piston rod exerts on this shape of cross-head, as well as to the top heaviness of the latter, there is a longitudinal tilting motion imparted to the cross-head, and if the guides permit it to move, a bending strain is giv en to the piston rod. This is concentrated at the point of least resistance, which is at the neck where the rod enters the cross-head, and breakage takes place there. Some of those who are suffering from the breakage of piston rods in this way are striving to remedy the evil by using improved rubbing surfaces and by protecting the guides from sand while others are preparing to change the form of guide. Those that bevel the piston rod before it enters the guide have the most annoyance from breakage. A partial remedy has been found in boring out the cross-head to admit the full thickness of the piston rod.

THE MECHANICAL CONVENTIONS.

The business to come before the mechanical associations at the approaching convention is not of a nature to excite consuming interest, but there are sufficient living questions to be discussed to promote interesting and profitable conventions. Although the same men and the same interests dominate both associations, there has been in the past remarkably little combined action between the two organizations on any subject. Last year both associations agreed to deal jointly with two subjects at the coming convention, which seems to be a harbinger of more cordial relations. A joint committee was appointed to consider means of abridging the time between the conventions, and to devise a plan for settling where the conventions of both associations should be held, and one to prepare rules for the care of air brakes. The first committee will report in favor of the M. C. B. Association meeting on the second Wednesday in June, and for the M. M. convention to meet on the following Monday. This will considerably shorten the time for those who wish to attend both conventions. The joint committees will also recommend that the place of meeting be selected by a joint committee composed of officers of both associations. We see no reason why the recommendations of the committee should not be adopted. We understand that the joint committee on care of air brakes has labored diligently, and prepared a voluminous and valuable report.

MASTER CAR BUILDERS' CONVENTION.

There is sufficient work laid out for the Master Car Builders' convention to occupy two days comfortably with the reading and discussing of reports and to leisurely go through the consideration of other routine matters. It is a very wise arrangement, which provides ample time for the discussion of reports. A report frequently embodies only the views of two or three members of the committee, and its most valuable purpose is often found to be in bringing out a full expression of the members in the discussion which follows its presentation. The discussion of the rules of interchange of cars will, of course, occupy one day; but there is every prospect of that tedious part of the business being easily finished in that time.

So much of the time of the M. C. B. convention has been generally monopolized by the discussion of the rules of interchange of cars, that the successful working of a plan which greatly reduces the time required for this discussion, and yet insures thorough consideration of the changes necessary in the rules, is worthy of hearty commendation. This plan was first put into effect at last convention and is operated by a committee on revision of rules of interchange known as the Arbitration Committee. This committee asks for suggestions of changes, amendments and additions to the rules which are carefully considered and submitted with recommendations for the action of the association. The rules of interchange are discussed in advance at the various club meetings, and the suggestions of changes agreed upon sent to the Arbitration Committee. The plan greatly facilitated the work of settling the necessary changes in the rules of interchange at last convention, and it will no doubt be found even more valuable at the coming meeting. The changes in rolling stock and the varying methods of doing business will always make changes in the rules of interchange of cars necessary, and it is a very wise plan, under the circumstances, to arrange for making the required changes with the least possible waste of time. The most urgent need about the rules of interchange of cars is more careful study of their enactments by parties ready to raise disputes under them. There are railroad officers constantly appealing to the Arbitration Committee cases of dispute that the rules leave no question about if they were only carefully read.

"Metal for Brake Shoes" is the first subject for consideration in the M. C. B. convention. If the committee can throw any new light on this subject, it will confer a benefit on many railroad companies, for the cost of maintaining brake shoes is serious on some roads, and is steadily increasing with acceleration of train speed. On the Manhattan Elevated, for instance, an ordinary cast-iron brake shoe wears only about seven days. It would be of great importance for railroad companies to learn the relative cost and efficiency of the common cast-iron shoe and the shoes that are made of harder and tougher material. The comparison would need to include the braking efficiency of the harder metal and its effect on the wheel.

"Steam Heating and Ventilation of Passenger Cars," is a living subject which has been reporting progress very satisfactorily for itself during the year. The committee having the subject under investigation is not likely to make a startling report. There are several systems of car heating in use that are giving satisfaction. The Association can deal with them only as they interchange with each other. This would bring up the question of a standard uniform steam hose coupler, and it would be fortunate if an agreement could be arrived at.

"Steel Plate and Malleable Iron in Car Construction," represents a subject likely to be more important a few years hence than it is to-day. Steel plates for truck centers and a few other parts are slowly growing in popularity, but there is no all-steel car yet in service that appears to have the elements of popularity about it. The forms of steel best adapted for frames of cars cannot well be covered by patent rights, and no one seems desirous of urging into use a form of construction that admits of no monopoly or special proprietary interest. Current practice does not indicate that malleable iron has any recognized position in car construction. The indications are that where cast iron is too weak or too heavy, cast steel will be used in the near future as a substitute.

The business laid out for the convention embraces report from the Executive Committee on "A Plan for Maintenance of M. C. B. Coupler Standards." The working out of such a plan is a consummation most devoutly to be wished. The logic of events appears to prove that the M. C. B. standard coupler has come to stay. A most important duty, then, to be performed, is the making of all the diverse shapes offered to railroad companies conform to the standard, or to devise means of showing conspicuously wherein they are not standard, a duty that the Association owes to purchasers of couplers. A complaint frequently urged against the link and pin coupler was the great diversity of forms in use. It was popularly supposed that the selection of a standard type would bring about uniformity, but the records of the patent office and the pages of the railroad journals seem to indicate that confusion in forms is getting worse confounded under the new type than it was under the old.

BUSINESS OF MASTER MECHANICS' CONVENTION.

Complaints were made last year that the Railway Master Mechanics' Association had too many subjects for consideration at the convention, and that the business had to be hurried through. If this was an evil it will be considerably magnified at the coming convention, for there are no less than fourteen committees which are required to submit reports. The majority of the subjects are important, and ought to receive careful and earnest consideration. Several of them are brought up for the second time, the reports for last year not having been deemed full enough. This is not generally a good plan. A meager report generally follows a lack of decided knowledge about a subject. When this is the case, it is better to let it stand over for a few years till information is better developed.

"Exhaust Pipes, Nozzles and Steam Passages," was a subject wisely continued, because the committee was engaged on experiments and on original research that was necessarily of a tedious character and difficult to complete in the first year. An excellent report of a limited scope was presented last year, and there is good reason for believing that the forthcoming report will present information that will be of great service to master mechanics in their efforts to reduce the final consumption of locomotives.

"Testing Laboratories, Chemical and Mechanical," is a subject on which a report will be peculiarly valuable at this time, in view of the action lately taken by several railroad companies in abolishing laboratories that have been established and in greatly curtailing the force in others. This we believe is the most short-sighted business that could be conceived, and that for every cent saved a dollar will ultimately be wasted. It will be for the committee having this investigation on hand to throw as clear light as possible upon the advantages that accrue to railroad companies from the work done in laboratories.

"Examination of Locomotive Engineers and Fireman" is one of the new subjects that comes up through the growing necessity for motive-power officers to ascertain the knowledge about their work acquired by the firemen who are candidates for promotion to the position of engineer. The day has long gone past when the necessity existed for the man running a locomotive to be competent to supervise the repairs of his engine; but it is highly important that he should know how to keep the machine in smooth-running order, and to put it quickly in condition for moving when a break-down happens. A man who considers himself competent to run a locomotive ought also to understand the working of the air brake and other train mechanism, and have some knowledge of the principles of combustion and the economical use of steam. On our best-managed roads the fireman, before being entrusted with the running of an engine, is subjected to an examination to show what he knows about these things. The fact of having to go through this examination makes him pay earnest attention to learning all about his business, and there is no doubt that railroad companies which follow the plan of examining their firemen obtain substantial benefits in return, for knowledge is power and ignorance is always wasteful and incompetent.

"Operating Locomotives with Different Crews" is a subject that has been repeatedly discussed at the conventions, but it is one upon which increased light is highly desirable. One of the most difficult problems that motive power officers have to struggle with is making the locomotives run as many miles as possible, and yet have men in charge who will take an interest in seeing that the engines are maintained in good order. One set of men cannot keep up with the mileage of a locomotive when business is good, and two sets of men do not earn a satisfactory income if they are assigned to one engine. The only recourse, then, is to run the men on the first-in-first-out plan, letting them take the first engine ready. This is the best that can be done for the men, as the number can be regulated to suit the work, but it is bad for the engines, as no one is personally interested in keeping them in proper order. The rapid running down of the machinery that results from this plan is due, in many respects, to the neglect of the officers in charge. They arrange for locomotives running under constant change of crews without making special provisions to suit the changed conditions. They growl and scold and punish men for neglecting the engines that are constantly changing hands. Instead of wasting their energies futively in this way, they should arrange and put in practice a system of inspection and maintenance that would insure the engines being kept up. If more attention was bestowed upon planning means of keeping in proper order engines that are run by ever-changing crews, and less inclination were displayed to finding fault with the operative department for requiring the engines to

be run hard, there would be better power maintained and more harmony preserved between the two departments.

"Locomotives for Heavy Passenger and Fast Freight Train Service" aroused a very interesting discussion at the last convention, and the committee investigating the types best suited for this service, have an excellent opportunity to make a valuable report. When an eight-wheel locomotive becomes too small for carrying the weight necessary for pulling heavy passenger or fast freight trains, it seems that the next natural step is to a mogul engine. Nearly all master mechanics protest that they have perfect faith in the safety of a pony truck for the highest speeds, yet this faith is not manifest in their practice, for ten-wheel engines are almost invariably adopted when a step is gone beyond the eight-wheel engine. We hope the committee on this subject will make it plain why the ten-wheeler is preferred to the mogul.

An important subject to be settled at this convention is the disposal of the Boston Fund. It is understood that several of the technological colleges offer very fair equivalents in the form of scholarships for the fund at the disposal of the association. The Lenigh Valley University and some other good educational institutions give education to students free, and there is a proposal that the Master Mechanics' Association use the interest of the Boston Fund to pay the expense of living for certain students the association may appoint. The convention will no doubt settle the question satisfactorily.

"The Present Status of the Car Coupler Question" may not yet be ready for a vote by the Master Mechanics' Association. Nothing will be lost if they wait another year before deciding whether or not the association can indorse from a mechanical standpoint the action of the M. C. B. Association in recommending the vertical type as a standard.

The master mechanic whose plans of a repair shop for locomotive repairs we published last month was anxious to have the opinions of other motive-power men respecting the design, and he has received them very elaborately, as a perusal of our correspondence columns will prove. The subject appears to have excited a lively interest, for we have some more letters crowded out, not being able to devote the whole of the paper to the subject. With one exception the letters published this month are from master mechanics in charge of shops of capacity equal to or greater than the shops proposed. Many of the suggestions about shop designs are excellent, and are well worthy of being remembered by those who are likely to have the building of shops on their hands.

BOOK NOTICES.

THE CORLISS ENGINE. Edited by Egbert P. Watson, *Engineer*, 150 Nassau Street, New York. Price $1.00.

This is a useful little book, made up from articles contributed by John T. Henthorn and Charles D. Thurber, to the *Engineer*. The first portion relates to theoretical considerations of the value of steam jacketing and of the distribution of steam in the cylinders. The conclusions of the author are not likely to meet with the general approval of engineers. The chapters on valve gear and valve setting contain valuable information for engineers. There are so many Corliss engines now in use that plain directions about valve setting are very much in request, and the points given in this book will make it a convenient and desirable pocket companion for many engineers. Lubrication, the air pump and its management, heating of mills by exhaust steam, are some of the minor topics discussed. The book is well worthy of extended patronage.

PRACTICAL BLACKSMITHING: compiled and edited by M. T. Richardson, editor of the *Blacksmith and Wheelwright*, New York. Price, $1.

This is the fourth volume of collections of articles on subjects relating to the blacksmith art, mostly contributed by practical men to the journal of which the compiler is editor. The series forms the most valuable compilation of articles on the working of iron and steel on the anvil that we are acquainted with. The present volume treats mostly of the manipulation of iron and steel and working it into familiar forms, mostly in connection with coach work. Considerable information of a valuable nature is given about the forging and tempering of springs that might be useful to most blacksmiths. There is also an exceptionally good chapter on working steel, welding, case hardening. The book is well worthy of a place in every mechanic's library.

HINTS TO POWER USERS, by Robert Grimshaw, New York. Cassell Publishing Co. Price, $1.

The little book seems to us as valuable as it is unpretentious. It is eminently a practical work by an author thoroughly conversant with the subject upon which he has written, treating on all the different classes of boilers and engines and every thing connected with them, and showing the principal sources of loss, danger and inconvenience in power-using, also the means of preventing the same. It is written in clear, plain language readily understood by the non-professional as well as the professional worker. Power users will find this book well worth reading and attentive study.

Personal.

Mr. John G. Snell, foreman of the car department of the South Atlantic & Ohio Railroad at Bristol, Tenn., has resigned.

Mr. J. B. Elwood has been appointed superintendent of the sleeping-car department of the Chicago, Milwaukee & St. Paul.

Mr. D. McKenzie, for some time general manager of the Pacific Short Line, has been appointed purchasing agent of the Central Vermont.

Mr. J. K. Lape has been appointed master mechanic of the Kansas City, Watkins & Gulf Railroad, with headquarters at Lake Charles, La.

Mr. William Wilson, who was well known in the West as formerly superintendent of machinery of the Chicago & Alton, is lying in a dangerous condition.

Mr. W. O. Chase, who has been for some time superintendent of the Chicago, Milwaukee & St. Paul, has returned to the employ of the Pullman Company.

Mr. Allen Bourn, the well-known purchasing agent of the Michigan Central, has resigned, to take the position of purchasing agent of the New York Central.

Mr. William L. Garey, son of the late Mr. Garey, who was long president of the Master Car Builder's Association was killed last month by being thrown from a horse.

Mr. J. A. Quinn has been appointed Master Mechanic of the Chesapeake & Ohio with charge of the Cliffton Forge shops and of all matters pertaining to the mechanical department at that point.

Mr. M. F. Egan, who has been for several years master mechanic of the Union Pacific in charge of the company's repair shops, has been promoted to the position of assistant division superintendent.

Mr. John C. Gault, late general manager of the Cincinnati, New Orleans & Texas, and one of the best-known railroad men in the country, was stricken in Chicago last month with a stroke of paralysis.

Mr. Z. T. Sprigg has been appointed master mechanic of the Union Pacific, with charge of the company's shops at Denver. Mr. Sprigg has been for some time draughtsman for the master mechanic at Denver.

Mr. Henry Tregelles, who was for some time a master mechanic on the Erie and later in the employ of the Westinghouse Air Brake Company, is now doing mechanical engineering work in Rio de Janeiro, Brazil.

Mr. S. B. Haupt, superintendent of motive power of the Norfolk & Western and superintendent of the Roanoke Machine Works, has resigned. It is said that Mr. Haupt has amassed a fortune in land investments.

Mr. S. A. Crone has been appointed Assistant Superintendent of Rolling Stock of the New York Central & Hudson River. Mr. Crone will be required to exert a general supervision of everything relating to cars. He has been for some time engaged as an inspector of cars.

At the twenty-fourth annual meeting of the Eastern Railroad Association, which took place May 13, the following officers were elected: Hon. Wm. D. Bishop, president; Theodore N. Ely, vice-president; A. A. Folsom, treasurer; Robert J. Fisher, general counsel; John J. Harrower, secretary.

An announcement is made by President Webb, of the Mohawk Valley & Northern Railway, that Mr. Angus Sinclair is appointed master mechanic of the company. This does not mean that the editorial chair is to be deserted for the engine-house. The duties entailed will not be very onerous.

Mr. A. M. Wellington, the well-known civil engineer, and editor of the *Engineering News*, has sailed for Europe to be gone all summer. Mr. Wellington is determined to find out the truth about the economy of fuel claimed for English locomotives if it takes him all summer to get through the investigation.

Mr. George H. Baker, who has several times contributed to our pages articles on the economical handling of locomotives, has been appointed fuel agent of the Southern Pacific. Mr. Baker gave some valuable assistance on the Chicago, Burlington & Quincy system as an instructor of the enginemen after the strike.

General Manager Bowen, of the Rome, Watertown & Ogdensburg, announces a variety of official changes due to the leasing of that road by the New York Central. Mr. Theodore Voorhees is made general superintendent, Mr. William Buchanan, superintendent of motive power. The old division officers are retained in their places.

Mr. R. H. Soule returns to railroad life, having accepted the position of superintendent of motive power of the Norfolk & Western. We always considered that the railroad world had lost one of its brightest and ablest members when Mr. Soule retired from the management of the Erie. The Norfolk & Western people are fortunate in getting such a good man for the head of their mechanical department.

By the death of Samuel M. Cummings, long master mechanic of the Pittsburgh, Fort Wayne & Chicago, which occurred at Boston May 6, another pioneer railroad mechanic has passed away. He was one of the charter members of the American Railway Master Mechanics' Association, and for many years took an active interest in its affairs. He was over 75 years of age at the time of his death.

Mr. James Macbeth, master mechanic of the West Shore at Buffalo, has been appointed superintendent of motive power of the Mohawk Valley & Northern Railway. This is the railroad that passes through the Adirondacks region in New York State, of which Dr. Webb is president. Mr. Macbeth was selected by the officers of the New York Central. The zeal and energy which he displayed in the performance of his duties at Buffalo commended him for the higher position.

Several changes were made last month among the division superintendents of the New York Central. Mr. C. M. Bissell who has been for nearly 20 years superintendent of the Mohawk division, has resigned and Mr. W. T. McCulloch, assistant superintendent of the Western division, has resigned also. The new arrangement transfers Mr. C. L. Rossiter from Harlem to the Western division, and Mr. J. H. Phyfe, formerly assistant superintendent of the Hudson division, takes Mr. Rossiter's place. Mr. Frank A. Harrington, who was previously assistant to Mr. Bissell, takes charge of the Mohawk division. Mr. J. H. Hustis is appointed train master.

One of our pleasures of the month was a visit from Mr. A. von Borries, mechanical superintendent of the railways of Hanover, Germany, and the inventor of various improvements on compound locomotives. Mr. von Borries was sent to this country by the German government to investigate the merits of our rolling stock. He speaks very warmly of the kindness he experienced on every hand during his tour. There are many features about our rolling stock that he greatly admires. His experience here has convinced him that steel is a better material than copper for fireboxes, and he is determined to make steel a success in German locomotives.

We are glad to hear that Mr. Edwin S. Canman, general representative of the Hale & Kilburn Manufacturing Company, of Philadelphia, who is said, even by Hermann and Kellar, to be the finest amateur magician in the country, has promised to give a performance in magic for the benefit of the Master Car Builders' and Mechanics' conventions, at Cape May. We understand that both Hermann and Kellar have tendered to Mr. Canman the use of some of their most valuable apparatus for this performance. He is said also to be importing some entirely new illusions from Europe. This performance will no doubt be the greatest success ever known at any convention, it being entirely original and attractive. The nights being exceedingly dull at any summer resort, Mr. Canman, as well as the Hale & Kilburn Manufacturing Company, deserves great credit for conceiving such an effective plan of entertainment.

Everybody connected with the New York Central Railroad is well acquainted with "Doc" Sawyer, who runs the inspection engine between the Grand Central station and Buffalo. Doc's engine is kept in a stall in the roundhouse with steam up, prepared to start out at any time when the officers of the road decide to take a spin. The inspection engine has a fine observatory that is capable of holding two dozen persons and is built over the boiler. Every officer of the road, from the Vanderbilts and Dr. Depew down, has a pleasant word for Engineer Sawyer. It is no easy matter to take the observation engine over the road and keep out of the way of regular trains, but Doc has the thing down fine and knows the time-tables of every division and the West Shore road as well. A sort of pet with Doc Sawyer is the inspection engine, and he grooms her down with the same care that would be given a horse. When any of the boys speak about making time and inquire how the engine acted on the road, Doc usually replies: "Oh, she's all right when I pat her on the back."

Inventors working on means of improving automatic air brake are constantly stumbling on the means of charging the auxiliary reservoirs while the brake is on, and they do not realize that increasing the air pressure in the reservoirs at that time prevents the release of the brake. A recent inventor in this line thought he had got something very valuable and took it to Mr. George Westinghouse, expecting to be offered a big price for the improvement. On hearing the man's account of his invention, the inventor of the air brake said, "If you men only knew the difficulty I had when scheming the automatic brake to prevent air from passing into the auxiliary reservoir at the time the brake was applied, you would not waste your time trying to get the air where it is not wanted."

Communications.

Efficiency of the Squeeze and the Pull Brake.

Editor National Car and Locomotive Builder:

In the April number of your journal there appeared a communication upon the subject of "The squeeze and pull brake." There have also been numerous communciations upon this subject, printed in various railway journals, during the last two or three years. In those articles which have come under the observation of the writer, there is abundant evidence of a vast amount of misapprehension, on the part of their authors, as to the principles of braking and the effects of various considerations upon the results. It is the desire of the writer to consider a few of these points and to clear up, as nearly as possible, in the minds of the authors of those papers, the mistakes under which they are apparently laboring.

Referring first to the above mentioned communication to your journal, the author states that he understands that the users of driving-wheel brakes with one shoe per wheel claim that they reach a point of resistance which causes the wheels to be just upon the point of skidding, and that they have a much smaller resisting force from the brake shoes than that employed by the users of the two-shoe driver brake. He further designates the respective brake shoe pressures, which the devotees of the two systems claim will bring the wheels nearly to the point of skidding, as 80 per cent. of the wheel weight for the two-shoe brake, and 65 per cent. of the wheel weight for the one-shoe brake.

The author's understanding of the matter is all wrong. No such claim is made for the one-shoe brake system, and it is never expected that a 65 per cent. braking force will do the work of an 80 per cent. braking force; nor is the 65 per cent. braking force regarded as the limit for the one-shoe brake; nor is it the one most used; nor is it supposed that the skidding point of the wheels is anywhere nearly reached. As a matter of fact, it is generally customary to use, for the one-shoe brake, a braking force of 75 per cent. The selection of such a percentage of the wheel weight is not that of the builders of the brakes, but of the railroads which use them, and it has been determined after long experience in the application of brakes to the driving wheels of locomotives.

The great variation in the coefficient of friction between the wheel and the rail, due to the condition of the surface of the rail, and the serious damage to the tires of driving wheels where skidding takes place, have caused the users of driver brakes to demand that the limit of braking force applied to the wheels shall be placed low enough, so that the danger of skidding shall be reduced to an improbability.

Any person or company, believing it feasible or better to use an 80 per cent. braking force, and insisting upon supplying driver brakes with that braking force, must have it out with the railroads as to the advisability or desirability of increasing the braking force to such a point. Should the railroads so desire, the makers of the one-shoe brake will unhesitatingly provide their brakes with such a braking force.

In the meantime, comparisons of efficiency between brakes of the one-shoe type, with the braking force called for by the user, and those of the two-shoe type, having a braking force differing therefrom, are useless and absurd.

There has been some "theorizing" in regard to the effect of journal friction upon the stopping capacity of brakes. This is amusing, because the application of the principles of mechanics comes so much nearer securing results than speculation as to what the results might be. The writer of the article in your April number undertakes, in a very simple manner, to demonstrate the exact relations between the journal friction and the brake-shoe friction. He has made a simple proposition of it by ignoring a number of conditions which enter into the question, and it is just such attempted demonstrations, where deductions are made from a portion of the premises, that are very misleading and cause serious misapprehension. The consideration of all the forces upon the driving wheels and axles, producing a retarding effect, is not a simple one, and so many elements of variation and uncertainty enter into it that it is impossible to secure results of practical usefulness with analytical methods. Nevertheless, in order to make a comparison, the writer presents below the actual retarding effect upon the different systems, under certain assumed, specific conditions, applying to both cases.

In the first place, it is too apparent to require proof, that the retarding effects of friction, whether applied to the wheel or to the journal, are to be measured alone by the frictional force between the wheel and the rail, which is necessarily employed to overcome it and turn the wheel. There are other forces, such as atmospheric resistance, which enter into the stopping of a train. These are necessarily neglected in this discussion. There is also a small retarding force, due to the rolling of the wheel upon the rail—*i. e.*, rolling friction—which is also neglected. Again, it is necessary to neglect the friction of the crank pins and all other moving parts of the locomotive mechanism; also the amount of the retarding force, which is absorbed in overcoming the inertia of the wheels and axles themselves.

It is merely considered, therefore, for the sake of the present comparison, that a certain pressure exists between the wheel and rail, and a certain frictional force between the two turns the wheel; a certain pressure exists between the brake shoe and wheel, with a resultant friction between them; a certain weight is brought upon the journal by the bearing, due to the locomotive itself, which must be combined with certain other pressures brought upon the journal by the bearing, to produce a resultant pressure, and an accompanying frictional resistance between the bearing and the journal.

The conditions assumed are, as nearly as possible, similar to those presented by the writer of the communication mentioned, and are as follows:

The weight brought upon the rail by each wheel—15,000 pounds; one-half the weight of a pair of wheels and the axle—1,500 pounds; weight of the locomotive resting upon the journal—13,500 pounds. The average coefficient of brake-shoe friction assumed in the communication referred to is 19.6 per cent., which is probably fair. For convenience, 19.5 per cent. is the coefficient here used. The coefficient of journal friction, assumed by the writer of the communication mentioned, is so far wide of the mark that its acceptance or consideration is out of the question. As may be found in the works of Thurston, Wellington and other authorities, the journal friction varies, under ordinary conditions, from 1.8 per cent. for a heavily loaded car to about 2.8 per cent. for lightly loaded cars. To use a coefficient high enough, however, to reach fully beyond a suspicion of unfairness, the writer adopts in these comparisons 2.5 per cent. as the coefficient of journal friction. The diameter of the journal is taken to be 1-9 the diameter of the wheel, the same as was used in the former communication. Fig. 1 shows the conditions, when the engine is moving with steam shut off and no brake of any kind applied. The vertical force upon the journal of 13,500 pounds represents the weight brought upon it by the locomotive. Incident to this, there is a friction between the bearing and the journal, which requires a certain frictional force between the rail and the wheel to turn the wheel, which, in turn, requires a horizontal pressure against the journal to push the wheel. Also, the frictional force between the bearing and journal itself tends to check the motion of the wheel, and requires an equal pressure in the opposite direction, between the bearing and the journal, to push the wheel.

It will thus be seen that there are several forces to be considered and three distinct pressures between the bearing and the journal to be combined, which will give a resultant pressure, differing in magnitude and direction from the others. These results are only obtained through successive approximations, and this applies to the results found in Figs. 2 and 3. In the case of Fig. 1, the resultant conditions

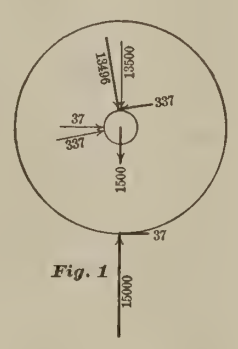


Fig. 1

are a pressure between the bearing and the journal of 13,496 pounds, producing a frictional force between them of 337 pounds, and also there is a frictional force between the wheel and the rail, necessary to turn the wheel, of 37 pounds, which is the braking force, when no brakes are applied.

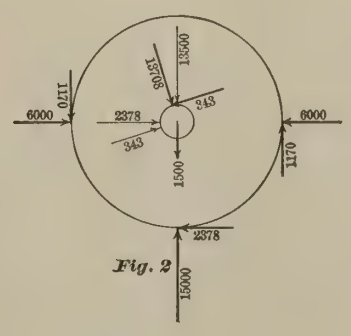


Fig. 2

Fig. 2 shows the conditions when the two-shoe brake is applied. Assuming that the coefficient of brake-shoe friction used applies equally in the cases presented, and, for comparison, that a total brake-shoe pressure of 80 per cent. of the wheel weight is applied in each case, the forces acting upon the wheel and axle, in the case of Fig. 2, will be easily traced. The same conditions are obtained as in Fig. 1—so far as the immediate effect of the brake-shoe pressure or friction is concerned—but the frictional force between the rail and wheel is considerably greater, requiring a greater horizontal pressure between the bearing and journal to push the wheel forward, and a combination of all the pressures upon the journal, due to these sources, gives a resultant pressure of 13,708 pounds, producing a journal friction of 343 pounds, with a total frictional resistance between the wheel and the rail of 2,378 pounds.

Fig. 3 shows the application of the same brake-shoe pressure and friction with one shoe, which is placed in such a position upon the wheel that the direction of pressure is shown at an angle of 30 degrees below the horizontal.

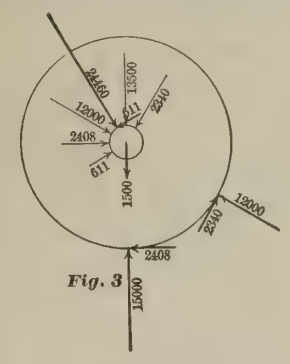


Fig. 3

In this case we have the conditions presented in Fig. 1, with the added ones of an equal pressure upon the journal opposite in direction to the frictional force of the shoe, which tends to pull the frame down upon the journal, and a pressure upon the journal equal and opposite to that between the brake shoe and wheel. We therefore find acting upon the journal, the following pressures: 2,340 pounds, the equal and opposite of the brake-shoe frictional force; 13,500 pounds, vertical weight from the locomotive; 12,000 pounds, being the equal and opposite of the brake-shoe pressure; 2,408 pounds horizontal, being the equal and opposite of the rail and wheel friction; 611 pounds, being the equal and opposite of the friction between the bearing and journal, due to the resultant from combining all these pressures. The pressure, shown by heavy line as 24,460, is such resultant, and it will be found that 2.5 per cent. of the same will give the journal friction shown—611 pounds—and that one-ninth of that journal friction (being the ratio of the diameters of the journal and the wheel) gives 68 pounds necessary friction between the wheel and the rail, which, added to the shoe-brake friction of 2,340 pounds, is the total friction between the wheel and the rail, or 2,408 pounds.

Comparing these results, we find that, when the engine is moving without steam and without brakes, the retarding force is 37 pounds. When the two-shoe brake is applied, the retarding force becomes 2,378 pounds. When the one-shoe brake is applied, the retarding force becomes 2,408 pounds. Now, with the coefficient of friction of 19.5 per cent., the brake-shoe friction, due to a brake-shoe pressure of 100 per cent. of the wheel weight, would be 2,925 pounds. Using this as a divisor, we find that the retarding forces acting upon the wheel, under the different conditions, are as follows:

	Per cent.
First—Without brakes, retarding force	1.3
Second—With an 80 per cent. braking force, applied with two shoes, retarding force	81.3
Third—With an 80 per cent. braking force, applied with one shoe, retarding force	82.3

While as before stated, the element of uncertainty, due to variable coefficients of friction, etc., renders the results obtained in this way of no practical service, it will be apparent from these figures that, with a given state of conditions, as near as possible to what may be considered to be realized in the average practice, the claims and theories, as to great discrepancies in the efficiency of the two systems, are utterly without foundation. It is a surprising thing that persons, presumably acquainted with mechanical principles, should argue, speculate and theorize upon matters of this kind, which are evident *per se*, when subjected to analytical or graphic consideration. As a matter of fact, the figures show that, if there is any advantage to be gained in point of efficiency, it is in favor of the one-shoe brake; nevertheless, the makers of the one-shoe brake are not striving to reach the highest possible efficiency, but attempt only that, which experience indicates to the railroads to be a safe one, giving as great security against accident as possible, without introducing too great a danger of injury to the driving-wheels, when the condition of the rails is such as to increase the chance of sliding. Since, also, the much-talked-of injury to rods, pins, journals and bearings, through the use of the one-shoe brake, has been demonstrated by long experience to be too insignificant for an assignable value, it seems as though it were about time to drop from the discussion, questions of stopping efficiency and hurtful effects upon the machinery.

There is one, and only one, thing to be gained by multiplying shoes in the driver-brake apparatus—that is, the enlargement of the surface of brake shoe contact with the wheel, and the consequent reduced wear and cost of renewals of brake shoes. It is a singular fact that, in the case of the two-shoe driver brake, of which we hear most of, the combined areas of the two shoes is less than that of the shoe used with most single-shoe brakes, so that the only profitable feature of the two-shoe brake is thus not realized. Even though the shoes were increased in area and this desirable feature thus realized, it still remains an open question whether the benefit, so derived in a driving-wheel brake, is not more than offset by the increased complication of parts to reach it, with the additional cost of maintenance and liability to derangement. This is the one feature for the devotees of the two-shoe driver brake

give their time to. If they are ever going to succeed in inducing railroads to use the two-shoe driver brake, it will be after they have ceased to cavil about the questions to which they have thus far been giving *their attention*, and have demonstrated that, in giving *equal* braking efficiency, their apparatus is sufficiently more economical than the one-shoe system, to excuse the objectionable features of their own.

NEW YORK, May 13, 1891. R. A. PARKE.

Those Model Repair Shops.

Editor National Car and Locomotive Builder:

In your May issue you present a proposed plan for repair shops for a railroad of 500 engines, upon which criticism is invited. The general arrangement and size of buildings is good, but, as every master mechanic has his own notions of the best plan, minor changes could be made to suit different roads.

The features that strike me are the unnecessary width of ground required for the plant, the absence of a foundry and the apparent lack of provision for future additions. It is wise to reserve room for increasing capacity by making additions to the original buildings, for railroad business is continuously growing, although the growth may be slow in some sections of the country. If the storehouse and office building were placed in the space between the transfer table and the round-house, and the boiler room in the space between the smith shop and machine shop, the whole plant could be put in a space 550 feet wide instead of 650 feet. These proposed locations would be equally as convenient as those shown on the plan, and with the further advantage that additions could be made to either end of the erecting shop, and at the same time to the boiler shop and paint shop, if so desired. In the ordinary conditions of location the main track would be adjacent to one side or the other of the plant, so that it would not be practicable to build additions to both ends of the erecting shop. If the whole 650 feet width is available, it would be wise economy to place the plant close to one side of the track by changing location of storehouse and boiler house, and thus get 100 feet reserved width for future additions.

T. APPLETON,
Civil Engineer and Architect.

CHICAGO, May 9, 1891.

Editor National Locomotive and Car Builder:

An important factor in the cost of locomotive repairs is the facility afforded by the design shop to do them. Defects in the designs are permanent when the shops are once built, and frequently, after that, we hear the designer say that if he had to do it over again he would do it so and so. The designers of the shops mentioned in your issue for May evidently wish to avoid regrets, after the shops are built, by asking opinions now and before it is too late, and I am going to give you and them mine.

The main thing in designing a shop is to get one that will avoid waste of time in handling material; that from the time the crude material is taken from stock until it is placed in the locomotive, there shall be no useless expense in handling it. The same principle applies to parts of the locomotive that may be removed from it for repairs. The next object is to get a design of shops that will allow a systematic division of the work under the first condition, and, again, that will admit of future enlargement of the works and retain the two conditions mentioned.

Under the first condition, forging should go by the most direct route from the smith to the machine shop, and, when finished in that department, pass directly to the locomotive. The same rule applies to most material contained in a storeroom, which, by the way, should be in a position that will give it control over all material.

To make a brief statement we can say that the departments most identified with each other are the following and in the order given: The erecting, machine, smith and boiler shops. The storeroom should have as central a position as possible, especially to the erecting and machine shops. If the above position is a correct, one then the design shown in your paper does not meet it. Work from blacksmith shop must be carried across the yard to the machine shop, and work from one end of the erecting shop, if required to go to the blacksmith shop, to be carried some distance.

To illustrate: Suppose a frame from a locomotive requires a new pedestal. The frame must go to the blacksmith shop. When the work is done in that department it must be taken the whole length of the erecting shop back to the slotter and planer. It makes no difference what pit the locomotive is in, the frame must travel twice the length of the erecting shop to go through the 'smith shop and onto the planer or slotter, while had the machine shop contained the slotters and planers in the first place, and if the 'smith shop was at the end of the machine shop, the frame would pass from it direct to the machine shop and then to the locomotive. The distance traveled by the frame in this case would have been about one-half that in the first, and would be diminished as the position of the locomotive approached the center of the erecting shop.

As stated, the machine shop draws the heaviest on the storeroom. If it does not it should.

All orders for work should go to the machine snop and let that shop provide the material with which to fill out the order. This seems to be the intention of the designers. As you will note, the castings are kept at the machine shop. This would imply that two storekeepers and accounts must be kept, while, if the storeroom was close to the shop, this would not be necessary, and time could be saved in handling material. Now for the boiler shop: While it has not so close a relation to the erecting shop as the smith and machine shop, still it is closer than the carpenter shop. It is often necessary for machinists to work on locomotives while in the boiler shop, and therefore there must be more or less intercourse with the machine shop. Again, men from the boiler shop will be required to do work in the erecting shop; this will remove both classes of mechanics some distance from supervision and cause loss of time from that cause as well as that of traveling between the two shops, and for that reason the carpenter shop could better change position with the boiler shop, which could also put the carpenter shop up to the tank shop, in which more or less carpenter work must be done, and would allow cabs and pilots, if wooden pilots are used, to be carried on transfer tables to each locomotive.

The arrangement of tracks to reach the boiler shop would have to be changed to the back of the boiler shop under the plan proposed, but this could be done by extending the transfer table to take one of the tracks shown between the end of the erecting shop and the storehouse.

In looking over the plans I see there is a third storehouse for casting at the tank shop; this storehouse arrangement seems to be bad throughout. But with the 'smith shop at the end of the machine shop, and the boiler shop in the place of the carpenter shop, why not put the storeroom and office in the place of the 'smith shop as shown in the design? Then casting sheds could stand between it and the machine shop, and an opening into the erecting shop would allow intercourse between the storeroom, erecting, machine and boiler shops, and also with the office, under cover.

In the above I have looked at an arrangement of the shop under the proposed plan rather than the main plan of the shop, and in doing so I have wanted to say that all machine tools, in my opinion, should be kept in the machine shop, and let the erecting shop be for that purpose only. With a machine shop in the position shown in the plan, the wheel and axle work could be done on one side of the floor and part of the yard used for storage. Driving-wheel work could be done at the end next the erecting shop. This would require the machine shop to be wider and longer, but I believe it could be put up with less expense than a wide erecting shop with its expensive roof, and will keep it free from columns.

I also believe that a shop that is intended to hold twenty-five locomotives could be made to better advantage with the erecting shop in two departments, with the transfer table in the middle. A position can be gotten for the machine shop that would bring it in as close proximity to both as having it in the center of a long erecting shop; also that the same applies to the 'smith, boiler and carpenter shops; it must also give a center position for the shop boiler and the storeroom, and would allow of future enlargements of all the departments without unduly increasing the distance from a central position, and that in any design the boiler, 'smith and carpenter shops should be separated from the machine and erecting shops. It is not well to separate the two last, but a distance of twelve or fifteen feet between them and the first avoids the smoke and dust inseparable from a boiler and 'smith shop filling the erecting and machine shops, and makes a fire line that will reduce the cost of insurance, as well as enable the two departments mentioned to be kept clean.

I am aware that objections are made to separating the departments in the manner mentioned, but the only objection to an open passage between the shop can be overcome by closing it; and if required to carry shafting from one shop to another, it can be carried on the passage as well as through a shop; then with iron doors to the passage, a fire can be confined to one department. C.

Editor National Car and Locomotive Builder:

The erecting shop shown on p. 68 has not pit-room enough for the repair of 500 locomotives, especially if they are fairly old and of the mixed types that result from an amalgamation of various independent railroads. If the locomotives are fairly new and of similar construction the 24 effective pits will suffice for the repairs and the renewals of from 410 to 430 heavy eight-wheel locomotives.

And if the given width of land is the extreme limit, it would seem as if any future extension of the erecting shop were impossible, so that when increase became necesssary a second shop would have to be built on the opposite (east) side of traverser, displacing the old paint, tender, and boiler shops, although it is probable part of these old walls are intended to be so utilized. Two erecting shops would be a nuisance and would practically entail the fixed charges of salary for two foremen. No shop under the control of one foreman should be longer than 600 feet.

A wood shop with two flats, giving a total area of 24,000 feet, is excessive, if all that is to be done is to make cabs, pilots, tender-frames and ordinary renewal patterns for 500 locomotives. The lumber shed is too close to wood shop. A 40-foot gap is required, and 50 feet would better protect from fire and meet the ordinary conditions imposed by insurance underwriters.

Smithy is located too far away from the heavy planers and slotters. Either change these machines to the opposite end of shop or locate the smithy on the ground occupied by the wood shop. If the engineering work to be done includes much frog-switch and diamond-crossing work, the floor room of smithy is too small. It is to be inferred that the renewals of axles, frames, side rods, foundation rings, etc., will be done elsewhere, as there is no space in so small a smithy for a forge.

The engine for smithy should not be inside that building because of its dust and dirt.

The land required would, in length, be nearer 2,000 feet than 1,000 feet, as the tracks shown must be brought together, so that the yard switcher could do all necessary locomotive yard work without interfering with the traffic switching and without touching the main line.

Horse power of stationary engines, as provided, is excessive compared with the pit room, except the ventilating fans absorb much power. Three hundred nominal horse power working 54 hours per week will repair 500 locomotives; that is, give power to all machine tools, blast fans, engine hoist and traverser.

There is no compensating advantage in the 50-foot space between traverser bed and east wall of erecting shop. It is not effective storage, and requires the building and keeping in repair of practically half a mile of almost useless track. No doubt it is occasionally used for wheel storage, but sidings for such service are most useful when close to wheel lathes or that portion of shop where main axle boxes and trucks are fitted. Special track accommodation is required for the unloading of truck wheels as received from the foundry and for their reshipment when on axles to the various round-houses.

Less wall surface would have been required if the buildings for the allied industries carried on in the smithy, boiler shop and tender-tank shop had been housed under one roof. The engines and fans could have been concentrated, and probably the number of heavy shears and punches reduced or a better use made of the tools possessed.

A hoist in erecting shop is absolutely necessary; therefore it is better to use an overhead traveling crane, as shown in the "model" plan. No foreman, after using a power traveling crane, is contented to be without it. But, granted head room enough for the movements of the crane, it is better practice to have a parallel shop with from three to five continuous longitudinal pits, thus dispensing with the heavy first cost of traverser, with its pit and solid foundations. An erecting shop so built occupies less land, is more compact, better suited to oversight of foreman. Its length (area) can be extended without interfering with the ordinary work of repairing locomotives, and to cut down the number of large doors from 25 to say 8 is an advantage workmen appreciate in cold climates. Probably 25 open doors would in the South be an advantage. In snow districts an outside traverser pit of 517 × 60 feet would in winter often be useless.

To conclude. The model arrangement is deficient in not providing accommodation for iron and brass foundry. There are few, if any, sections of work about locomotive repairs in which a greater economy can be made than in the railway company making its own castings. So doing, it is sure of the quality of material used. Emergency work can be put through rapidly, and no large stock of castings need be carried in hand. Of course this establishment should supply the engineer and car departments with all the castings they require. DELMO.

Editor National Car and Locomotive Builder:

Noting request in issue of May to criticise plan of "Model Locomotive Repair Shop" I have carefully examined the plan and note the transfer table. If the shops are to be built in a country subject to snowstorms, the labor and expense of cleaning out and hauling away snow from the transfer-table pit is worthy of serious consideration.

The three buildings, wood, machine and 'smith shops—each 80 feet wide—are built to side of main shop, making 240 feet. Of this shop, nearly one-half is shut off from the light. This appears to be a serious objection; one which the monitor roof will not obviate.

The plan does not show where the vise hands, or fitters, are to be located. If the benches are to be located next to the wall of this shop, the want of light will be felt more keenly. If the vise benches are placed in the wing marked "machine shop," the moving of work from main, or erecting, shop to this shop and back again to engines will be found quite expensive. The item of labor in moving material from one point to another in large works of this kind is heavy, and effort should be made to reduce it to a minimum.

A part of the upper floor of the machine shop is to be used for storing parts of engines. If this is machinery kept in stock, better results would be obtained by keeping it in a storehouse in charge of a storekeeper, fitting up and making proper charges of stock, and then turning into storehouse to be issued by storekeeper on regular order. It would then be more likely to appear in the proper place in the accounts.

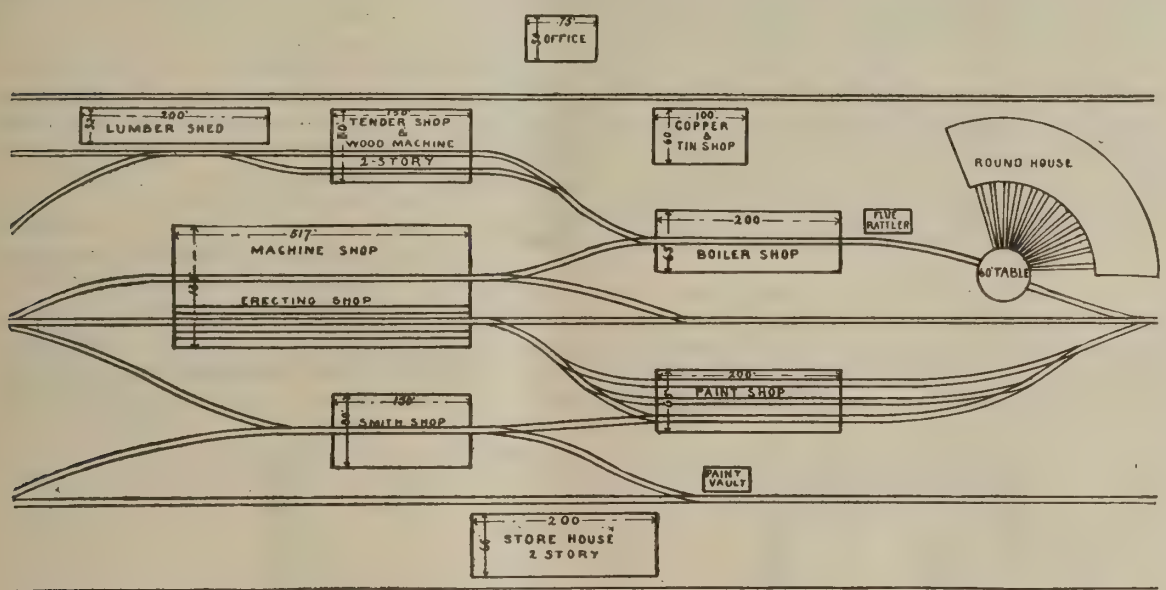
From the plan, it looks as though there might be a surplus of power. Two 100 horse-power engines are marked to run main and machine shops. It looks as though one

150 horse-power engine should run both these shops. If there is much woodworking machinery in wood shop, a 50 horse-power engine will not be sufficient. Woodworking machinery requires plenty of power, and a surplus here would be an advantage.

In 'smith shop, instead of one engine to drive, it might be better to drive the bulldozers, punch, shears, etc., with small engines connected with a part of the machine. This would leave bolt-headers and tools of that class to be driven by belt. Gas in a 'smith shop is very destructive to belting. It is in the line of economy to have as little as possible. Shafting and pulleys are also expensive.

The boiler shop does not show a traveling crane. One should be provided for handling boilers. It is a very useful tool in a boiler shop, and will pay well. It is frequently necessary to turn a boiler over for repairs and putting in fireboxes. A crane of sufficient power to handle the largest boiler with flues in should be provided. Where a boiler has to be taken from an engine for repairs, it could be taken to the boiler shop with flues in, lifted with crane and set in a convenient place for work, and flues taken out. All facilities for cleaning and piecing out flues should be in boiler shop, and flues reset before boiler is removed to erecting shop.

If the road is equipped with iron tender frames, a separate tender shop would not be necessary, as all the work would be done in boiler shop, it being about all boiler work with the exception of trucks. Men could be employed in boiler shop to repair trucks; in this way all the tender work concentrated in one shop. If the tenders are to have wooden frames, a separate shop would be desirable, but, as boilermakers would have to repair tanks, tenders could be run into boiler shop, tanks taken off, and frames sent to tender shop. The tools in boiler shop should, as far as practicable, be run by engines connected with and a part of them; use of belting to be avoided.



The paint shop is 60 feet wide. It is noted this will hold 16 tenders. It is not stated whether engines are to be painted in this shop or not. The general practice is to paint engines in the erecting shop, few roads having a paint shop for engine work. The practice is bad and expensive, as painters, machinists, coppersmiths and boilermakers are all at work at the same time finishing an engine, and in the way of each other. The result is poor and costly painting. A better plan would be to finish an engine ready for painting, then run engine and tender into paint shop and do the work. The engines will not at first get into service quite as quick as the former way, but after it gets working properly there will be very little difference. If engine and tender are put into paint shop coupled, 60 feet is not wide enough for the shop, as 57 feet is not an unusual length for a consolidation engine and tender.

The office is shown as part of the storehouse. It would be more satisfactory if the office were isolated from the other buildings, about which there is always a fine dust which works into the office, covering drawings, papers, etc., soon making them illegible.

The storehouse, 50 feet × 100 feet, is too small for the shop. It should not be less than 200 feet, if not longer. It is almost the universal practice of railroad companies to build their storehouses too small; the result is, valuable material, which should be under lock and key, is permitted to lie outside.

The plan shows two casting sheds, one at machine and one at boiler shop. It would be better to have all castings and other material kept in storehouse and delivered from there on order. The more these "stores of material" are scattered, the more the responsibility of properly looking after them is divided, and least likely to be properly accounted for.

As the erecting shop is to be furnished with a traveling crane, it would be well that proper attention be given to the structure that carries the crane: to have it solid, as in working there is considerable jar, tending to damage building.

It might be suggested that the arrangement of erecting shop be changed, and the tracks replaced with three tracks under crane extending the length of building, center track extending through building connecting with outside tracks; all three tracks with pits entire length of building, the center track used for running engines into shop. When in shop engine to be lifted by crane to one of the side tracks, necessary repairs made, and, when finished, ready to take out, lifted over onto center track and run out of shop.

The plan shows 25 pits, the limit of the number of engines that can be set in. With the three-track arrangement 13 engines could be placed on each side track, making 26, and from three to five engines needing light repairs on the center track. These tracks and necessary space between and outside of tracks would require about 50 feet in width. The outside wall would carry one end of crane, the inside end of crane to be carried on piers and plate girders. The roof truss to be carried on plate girders borne by same piers. This would leave a large opening connecting erecting shop with machine shop. The outside wall would have benches placed underneath the windows to be used by vise hands and fitters.

Good light would be obtained from these windows, which is difficult to get from doors when pits are used, as light must come from them, the space between doors not being wide enough to place windows. The shop would also be uncomfortable in cold weather, as there is a great deal of cold air passing into a building with 25 doors on one side. This part of the building, with tracks, might be called the erecting shop, and should have a separate roof, which, on account of the crane, would be higher than the remainder of the building, which might be called the machine shop.

The erecting shop would be about 50 feet wide, the machine shop 80; total, 130 feet. The machine shop in the wing would not be needed. One hundred and fifteen feet in width, as shown on plan, would be found too narrow. The boiler, 'smith and paint shops could be separate buildings, as shown on sketch herewith. With this plan, transfer table and pits would be avoided; all shops easy of access from either end. The copper and tinsmith shops would be in separate buildings. The tender shop, two stories. Wood working machinery could be placed in this building, and tender frames, if of wood, repaired; also cabs and woodwork of engines made and repaired.

The radial arrangement of the West Shore shops, described in May number, is worthy of consideration.

* * *

The Defect Card.

Editor National Car and Locomotive Builder:

This addition to the equipment of railroad cars, although a seeming parasite, appears to have become a necessity, so it should be properly provided for, and as a standard size has been adopted for it; why not go a little farther and equip cars with a *pocket*, a *recess* or a *cage*, with a cover loosely hinged, to carry the card. Many times cards are so dirty, defaced or marred that it is difficult and indeed impossible to obtain any information from its face, so in actual practice the card has to be torn off, so that the back side can be seen; and if the information found there corresponds to the defects, the card is then renailed and car allowed to pass, but the next interchange point has to repeat this operation. A convenience of this kind for carrying defect cards would hasten cars past interchange points. Objection may be made that these cards were never intended to be allowed to run on cars until defaced and debilitated by old age and much travel. Man proposes, but the actual practice of interchange service disposes.

Defect cards are applied to cars in good condition and do stay on until worn out, and the practice has the tacit consent and countenance of heads of car departments, and for cogent reasons, among which are, that the date of return of car is not known, and that unlike the superintendent of tracks, who has the same number of miles of rails in the same place, and can always feel a reasonable surety of finding his charge and knowing its condition, or the official in charge of the engines, who can keep a close record of condition and location of the machines under his charge, the officer in charge of the cars of a railroad has really no control of their movements, cannot guide the time of their return or their condition either loaded or empty, so cars must be either kept in the pink of condition or means found to allow of their quick passage from point to point in their many journeys. The defect card is an American institution, and of course the usual mighty results that are expected from these peculiar products of our continent are demanded from these pieces of printed and written pasteboard. The freight departments of railroads expect defect cards to prevent all delays from breakage of cars under load, or failure of cars under the crushing strains of excess loads, and in extreme cases to protect loads from all damages from the elements, even if car before being loaded has a *leaky roof* sign on it. The operating departments expect of a defect card that it will safely carry cars through the attrition of the process of "making up" trains and of the sawing by of trains, also of an occasional derailment, and once in a while through the shock of a collision. So much was expected from these cards that upon their failure to achieve all that was demanded of them the "ominous glances" of general managers were cast around their systems to discover the causes, and the interchange inspector has been offered as a sacrifice to disappointed heads of departments. But still delays continually occurred in spite of the defect card. So along came the joint inspector, with autocratic authority and czar-like power for giving dispatch to traffic through interchange yards. But alas, even a liberal use of defect cards does not add to the strength and longevity of rolling stock, or maintain the freight equipment of railroads in the highest state of effectiveness at a minimum of cost. So, to the joint inspector must be added the line inspector, and after that a system of car inspection that will cost less than at present, and in the end cause the defect card to move in its proper orbit, and its use to be the exception instead of the rule.

DOPE BUCKET.

Defects of the Car Truck.

Editor National Car and Locomotive Builder:

In reading some articles in your paper, wherein the writer argues the greater danger of derailment of cars with swing trucks over those with pivot trucks, it occurs to me that the writer overlooks one element of danger that may be greater than any dynamic action from car swings on curves can possibly be, and *this is the distortion of the truck frames when traversing curves.* The plan of the modern truck for freight cars is that of the letter H, with the base and top of letter parallel with the rails. Now, with an average distance of 54 inches between centers of axles and a base of 14 inches where the frame bars are bolted to castings on bolster and spring beam, the leverage of thrust of axle on the frame while traversing a curve, tending to make the truck and axles take a diamond shape in plan, is three to one. The frame and bars being only held loosely between lugs on casting by two through bolts at each end of truck beams, the effect of flange friction on entering a curve is to retard the outer wheels and advance the inner ones to the extent of the lost motion of the frame and spring of bars. So the axles are no longer approximately radial to center of curve, and the frame and axles are no longer a parallelogram in plan, but assume more or less a diamond shape. The wear of frame bars in the castings, bolts in frame and bolster in castings of old cars is quite noticeable, showing that this distorting action is going on at every curve the car has traversed, and it only needs the combination of a badly worn truck frame, a sharp curve and high speed to force the truck frame far enough out of shape to let the inner wheels drop on the ties, the outer wheels to mount the rails. The usual report on such an accident is given, *the rails spread,* when the real cause was the truck frame was so much distorted by the flange pressure on the outer wheels that the inner wheels dropped off the rail.

Consider for a moment the method of driving the truck. Above the center of the axles and nearly level with the top of the wheels by the center pin the power to push the truck is applied while the weight of car body on the rub irons, by its friction, holds back the truck from assuming easily its proper position while traversing a curve; and as the load is carried mainly on the rub irons, it is plain enough that it will take considerable pressure on the flanges to turn the truck to its normal position to the curve. Mr. Bridges Adams, in designing the radial axle-box, showed a clear understanding of the position an axle ought to assume when traversing a curve and it may be that in the improvements that are yet possible in railway appliances a three-axle truck for heavy freight cars, with radial axle-boxes for front and rear axles, will yet be found to be of great value in promoting safety and reducing train resistance on curves.

Ing.

Operating a Train in a Flood.

Editor National Car and Locomotive Builder:

I noticed in the March number of your valuable paper an article headed "Moving Trains through a Flood," claiming to be the most remarkable feat in the history of railroads and floods, and that it has never been equaled before and may not be duplicated again for years.

The article does not give the distance the train was drawn through the flood, the depth mentioned, but it could not

have been more than one-eighth of a mile, as I know from practical experience that a lone engine with 140 pounds of steam cannot propel herself over one-eighth of a mile in five feet of water before the pressure is reduced to 70 pounds and the fire extinguished, there being no more steam generated; 70 pounds of steam will not move a single coach and engine in five feet of water.

I attach hereto a clipping from a New York publication of June, 1885, giving an account of my experience with a flood while master mechanic of the L. R. M. R. & T. railway, which I think will go the P. & L. E. railway one better, considering that no preparations were made beforehand, the number of people, the distance, the depth of water, and the danger of being unsuccessful, having no means at hand to rescue the people, as the location was in a dense forest and many miles from any human inhabitants. F. HUFSMITH, Master Mechanic.

PALESTINE, Tex., May 4, 1891.

The following is the article referred to by Mr. Hufsmith:

"On the morning of May 4 the passenger train left Arkansas City with an excursion of about 250 people, and consisted of a baggage car, four passenger coaches and a flat car, drawn by a passenger engine of the ordinary type, having cylinders 16 × 24 inches, with five-foot drivers, and encountered the flood about 35 miles east of Arkansas City, which covered the track for a distance of about eight miles. For five miles of this distance the water was about 4½ feet deep, but for a considerable distance it was five feet, just covering the tops of the driving-wheels. Two cars were left in the water, but the engine drew the balance of the train through and brought it out on the other side.

"The fire was made by filling the lower part of the fire-box with cord-wood, then piling about a ton of coal in lumps on top of it, to make a foundation for the fire. On top of this a fire was built of wood finely split. The height of the water left about 1½ feet clear space between the water and the crown-sheet of the fire-box, leaving a few rows of flues uncovered for draft. The steam on the engine was run up to about 135 pounds pressure, and the train ran each time about 2,000 feet, which reduced the pressure to about 60 pounds. After about 20 minutes' delay the steam was again run up to the maximum pressure, and the train again went forward till it was reduced as before, thus requiring the train to be started about 15 or 20 times, taking about half an hour each time.

"The master mechanic of the road, Mr. F. Hufsmith, was on the engine and personally directed the work, and is entitled to the credit for its successful performance. There is no difficulty with an engine properly fitted up for the purpose to run through even deeper water, so long as the track remains in its proper place In this instance it was back-water, without current, and there was no danger from disarrangement of the track."

The Iron Horse is Safest.

They were talking about a runaway team accident where an old conductor, who had for many years passed safely through the perils of Western railroad service, was thrown from a buggy and instantly killed. John A. Hill felt very melancholy over the accident, for he had often pulled the conductor and had been in the habit of cautioning him against the dangers of knocking down, but neglected to say a word about the reckless horse. With a tear in his voice he now advised his hearers to use a short-fed burro if they ventured to ride anything less reliable than a street car.

"I despise a horse," said W. W. Thompson, traveling engineer of the L., "and I think a railroad man who fools with horses is short of judgment. No more horses in mine!"

"I tell you, boys," continued Billy, as a far-away look came into his eyes and he cut the biggest half off Campbell's plug, "I ran a horse part of one trip and then I made up my mind that a locomotive was good enough for me.

"It was in the Fall of '77 that I struck a job in California, and everybody kept telling me that I ought to keep a horse for my wife to drive round. They kept on telling me that. Everybody said it was the correct thing to do, just as having a seat in church is the correct thing in other places.

"Well, boys, I never did take any stock in horses since a wall-eyed mule had thrown me into an osage-orange fence years before, but they would not let me alone and insisted that it was not respectable to be without a horse; and then Ella got into the notion that a horse was necessary for her health and comfort, so I gave in at last. There was a Major Hawley who kept a livery stable in the place and sold horses, so I went to him to buy a horse. The Major knew I was a railroad man, and he did not have a high opinion of railroad men's judgment of horse flesh. So when I told him I wanted to buy a horse he called out to one of his men, 'Mike, show this gentleman No. 95.'

"I went with Mike to a stall and looked at 95. On the A. & B. road, where I ran for some years, they had an engine of that number that was famous for accidents, and I thought there was some connection between the horse and the engine, so I kept clear of his drivers. When I had looked the horse over a little I said to Mike, 'I don't think that horse is first-class;' when he hasn't but one eye.

"'That's no fault,' said Mike; 'what the eye does not see the heart does not grieve for.'

"'But I don't like to see a horse without a tail,' said I; 'what have you done with his tail?'

"'He had no use for a tail,' said Mike, 'so we put it onto another horse.'

"'I would like it better with a tail, and think you had better put one on.'

"'We can't do that, for it would be selling on retail, and we do a strictly wholesale business,' was the answer Mike made.

"'That's all right, then,' said I, 'but what's the matter with that hind leg? It has no hair on.'

"'This horse,' said Mike, 'was foaled on the Duke of Argyle's estate, and he got so much accustomed to use the scratching-post in his youth that he still keeps it up. That's a good point in a horse; it saves clipping.'

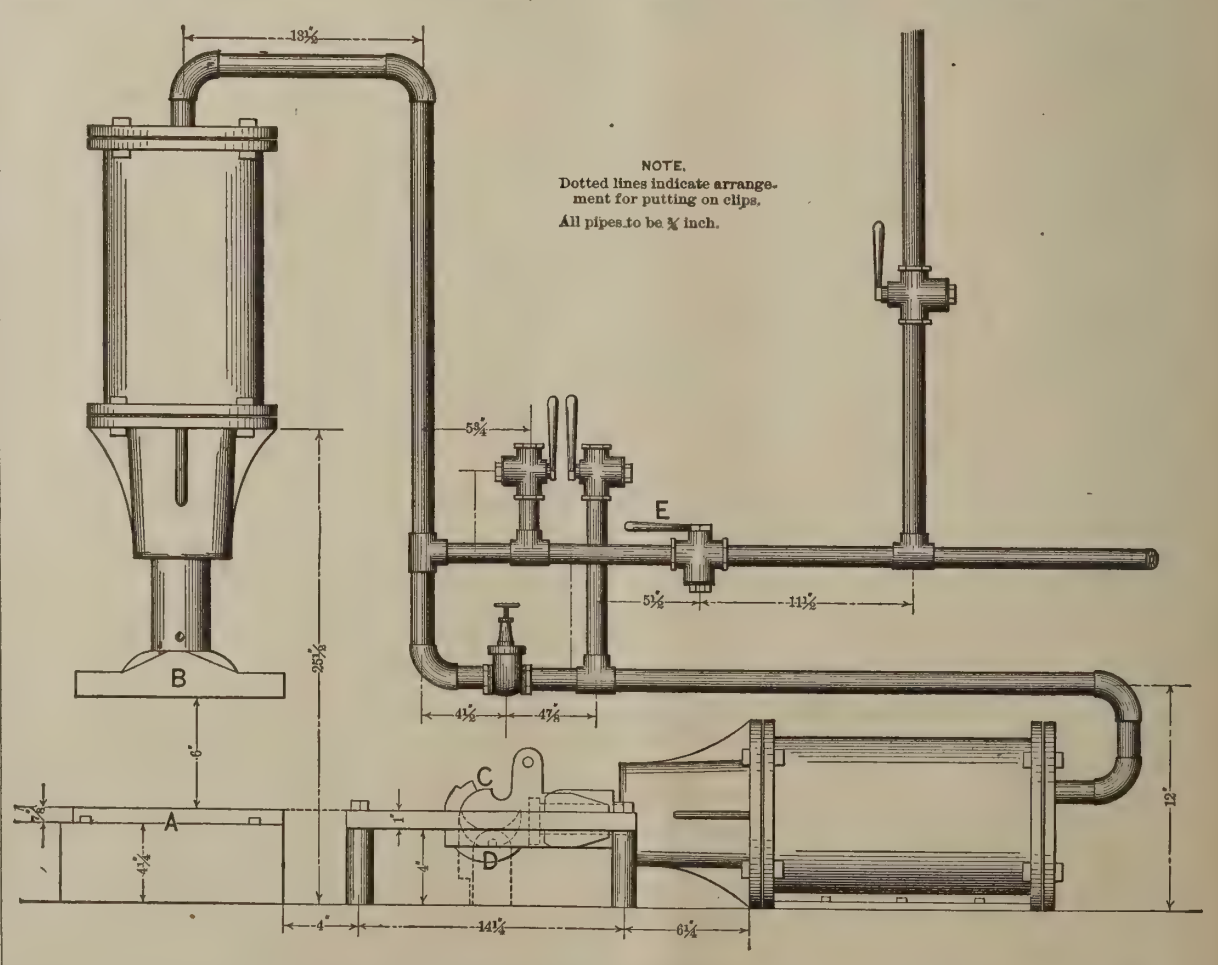
"After learning that the horse was gentle as a lamb and just the animal for a woman to drive, I thought I would drive him round a bit to see how he went. They put him in a light wagon, and I started to show my friends that I had joined the social swim, and was in the future to sport a horse. As I drove round I did not like the way the horse played with his ears. It is natural for me to watch a horse's ears, for they are in front like the flagstaffs of a locomotive, and they sort of indicate the way the wind is blowing.

"One ear would be pointing straight at my eye and the other would shake itself at a prairie dog, and then both ears would be laid in the animal's neck as if to take a rest. This happened pretty frequent. But the horse behaved beautiful till we came to an irrigating ditch outside the town, which I wanted to drive over. The horse did not like going into the water, but I gave that horse to understand that he had to go, and of course he went. Just as he got into the water the wagon pushed down upon him and he stopped short. Then he raised the middle of his back until it looked like an inverted driving spring, and one of his feet flew past my jaw, giving it a passing rap. I thought at first half my head was gone, but I knew by the way I commanded that horse to be quiet that a good big hole was left to shout through. However, shouting did no good I presently found myself lying in the irrigating ditch beside a wagon that looked as if it had been struck by the limited, and the horse running back to the stable.

"Major Hawley made me pay $65 for damage done to the wagon and for letting the horse kick the hair off his left leg. I settled, but there is no more horse in mine. Not much."

Air-hose Fitting Apparatus.

The annexed illustration shows an apparatus used by the Atchison, Topeka & Santa Fé at Topeka for applying the iron attachments to air-brake hoses. The apparatus was worked out by degrees by an ingenious German who was engaged on applying the fittings to air-brake hoses, and it facilitates the work so surprisingly that it ought to be employed by every company using large numbers of cars with air-brakes.



The main part of the apparatus consists of two air-brake cylinders which supply the power and work together. *A* is a cast-iron block with a longitudinal bed that fits an ordinary air-hose, and the block *B* is also channeled to clasp the hose. The plain hose cut to the proper length is laid in the block *A*, and a pipe mandril put inside to prevent collapse. The fitting to be applied is put in the holder *C*, and the attendant admits air into the cylinders by opening the cock *E*. The block *B* then descends and grasps the hose, and the piston of the other cylinder pushes *C* forward and forces the fitting into the hose.

The dotted lines at *D* show a clamp arrangement that was used for grasping the coupling while the hose clamp was applied, but they have got an improved rig for that work now in use.

With the apparatus shown one man can apply the attachments to about 300 hoses in ten hours, and finish them ready for service.

He Secured the Order.

The first order he received from Mr. James T. Furber, the well-known general manager of the Boston & Maine, is a sore subject with Mr. C. H. Dunham. Shortly after he started out to sell his car grain door, Mr. Dunham heard that the Boston & Maine had ordered 400 new cars, so he made the closest bee line that he could find for Boston and Mr. Furber's office. He had never met Mr. Furber before, but he walked in with all the modesty for which he is noted and said:

"Mr. Furber, I am delighted to make your acquaintance. I am Mr. Dunham, of the Dunham Car and Grain Door Company. It is the best grain door that has ever been invented, and is convenient and cheap, besides being the most durable thing of the kind ever seen. It is never in the way, and is capable of materially increasing the capacity of a car, besides being very useful for preventing the sliding of wheels, and is a certain remedy for broken drawbars, and increases the value of the grain carried 10 per cent. Your road cannot afford to build cars without this door, and I have called to book your order for the cars I hear you have ordered from Detroit."

Mr. Furber, who is noted for the vigor and picturesque order of his expletives, listened with benedictions moving toward his lips. As soon as he could get in a word he exclaimed: "You —— —— —— ——!" and then, as if experiencing a change of heart, he altered his tone and said: "Men with your gall ought to be encouraged. Go and put your grain——door on the cars."

Dunham felt elated, and hurried away to Detroit to see that no mistake was made in having the grain door put in the cars. When he got to the works he found that the cars ordered were flats.

The Schenectady Locomotive Works are putting in a plant of water tubular boilers for running their machinery, which will carry a working steam pressure of 225 pounds to the square inch.

It is reported that the Grant Locomotive Works Company, Chicago, have contracted for the building of their shops. The leading spirit of this enterprise is Mr. E. T. Jeffery, formerly general manager of the Illinois Central. Mr. Morris Sellers is one of the directors. The works will open with a capacity of 250 locomotives per year. The buildings will cover 200,000 square feet.

Those who suffer inconvenience and incur expense through unreasonable delays in the delivery of telegrams will be interested in a decision lately made by the Superior Court of Kentucky in a suit brought by a distillery company against the Western Union Telegraph Company for damages, owing to the protracted delay in the delivery of a telegram. The distillery company were compelled to suspend work for twenty-four hours, and the court held the telegraph company liable for the loss incurred.

The boiler of a locomotive belonging to the Rome, Watertown & Ogdensburg Railroad exploded with terrific force at Oswego, N. Y., last month, killing the engineer and fireman.

The New York Central system fell in line with first-class practice on June 1, by adopting the air train signal. They had flirted at different times with other systems that promised to make a success, but they finally decided that air was the only reliable medium between the engineer and the train.

Two private cars are under construction at the East Buffalo shops of the Wagner Palace Car Company. One of these is for Dr. Seward Webb, President of the Wagner Car Company, and the other is for Mr. George Vanderbilt. The company is now employing about 1,200 men in the various departments of the shops.

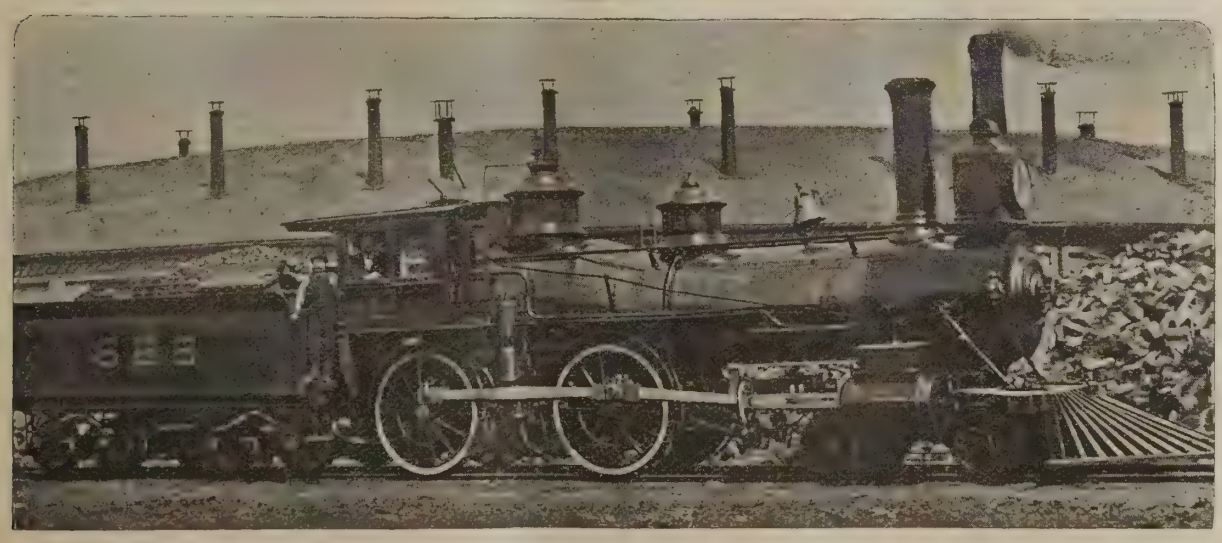
We have in this country more miles of railroad than the whole of Europe, Asia and Africa, and the freight carried on railroads of the United States in 1890 exceeded, by over 36,000,000 tons, the aggregate carried on all the roads of the United Kingdom, Germany, France and Russia. A report issued last month showing the returns of 145 of our railroads for a given period of this year, compared with a like period in 1890, shows an increase of no less than four per cent. on the amount of tonnage removed.

During a recent visit to St. Louis we spent a very pleasant day in the works of the Scarritt Furniture Company, watching the manufacture of car seats. The works are very extensive, car seats being only a small part of the product. But the iron mechanism for car seats alone keeps a good-sized machine-shop busy. The fitting of the mechanism for reclining seats calls for considerable skill, and improvements are constantly under way to produce seats that will take away the fatigue of long journeys.

The Barney & Smith Manufacturing Company, of Dayton, O., has been given an order for 45 passenger coaches and five dining cars for the Northern Pacific. This company, and the Pennsylvania Car Company, of Detroit, Mich., will build a large number of flat, gondola and box cars for the same road.

A Fast Freight Locomotive.

Mr. Jay Gould passed over the Chicago & Northwestern last month in a special train at a speed which proved that the Wizard of Wall Street has as much courage in traveling as he has in hammering the stock market. It also proved that the railroad company has locomotives that can run. The run was made from Omaha to Clinton, Ia., 362 miles, at an average running speed of 62 miles an hour. On the Chicago division the engine pulling the train had a hot box, and a freight engine was put on. Every railroad man knows that when a freight engine is put onto a passenger train in an emergency noteworthy running may be expected. This was no exception. The



passenger locomotives slipped along with the train contented with a speed of about 60 miles an hour, but when the freight engine got warmed to her work she hummed up to 76½ miles an hour. That was engine 628, shown in the annexed engraving, run by Mr. Charles Oberhart. She was built at Schenectady in 1886, and has cylinders 18 × 24 inches and drivers 63 inches in diameter.

Charles G. Ellis.

On May 15, Mr. Charles G. Ellis, president of the Schenectady Locomotive Works, died at his residence in Schenectady, N. Y., after a brief illness, aged 48 years. In this sudden death a host of our readers lose a genial friend, and the workmen of a large establishment lose a generous

CHARLES G. ELLIS.

and warmly considerate employer. Mr. Ellis was born in the town where he died, and has lived all his life among the friends who are now mourning his loss.

Some forty years ago, when our railroads were in their infancy, Mr. John Ellis, an industrious and frugal Scotch mechanic of good business capacity, purchased an interest in the Schenectady Locomotive Engine Company. From a small beginning the works have gradually grown and prospered, and not a small share of the success of the enterprise was due to the perseverance, integrity and energy of the elder Ellis, whose sons grew up with similar characteristics. The locomotive works was the playground of the boys, and they naturally followed their father's footsteps in business. The father died in 1865, and was succeeded as president by his son John, who died in 1884, and was in his turn succeeded by his brother Charles, now deceased.

Up to this time the works were run on the old building method, interchangeability of parts not being strictly attended to. Mr. Ellis perceived that the advances in this business called for the work being put upon a rigidly manufacturing basis, the parts to be made according to standard sizes and not to fit on a particular engine. Under his fostering encouragement the works made a great success of this system, and they are now able to compete in the character of work and in price with any locomotive building establishment in the world. Charles G. Ellis has finished his labors, but he leaves behind an industrial monument of greater value than the achievements of most men whom the world has called great.

The Savannah, Americus & Montgomery have ordered 300 box cars from Ohio Falls. They are equipped with all the latest improvements.

Parties interested in reducing the cost of brake shoes and other castings of a simple form ought to visit the Samuel Moore & Sons Works at Elizabethport and watch the operation of the Tabor molding machine. Any intelligent man can learn to run this machine in half an hour. It is of extremely simple form and molds fifty flasks an hour easily. Master car builders and master mechanics ought to stop off at the convention time and see how the machine works.

Complaints having been made that Mr. Walton, proprietor of the Stockton Hotel, at Cape May, was not keeping his agreement respecting terms for accommodation for parties intending to be present at the conventions, a joint meeting of the Executive Committees of the Master Car Builders' and Master Mechanics' associations was held in the Murray Hill Hotel, New York, to investigate the matter. Mr. Walton was invited to be present to explain his method of assigning rooms and the charges he is making. He explained that the first selection of rooms had been given to members of the association, at the regular rate of $3 a day for each person, and that most of the complaints had arisen through his efforts to get two persons to occupy the ocean front rooms. He was ready to provide a room for every person at the rate agreed upon, but when one person occupied a room it must be the class of rooms that are not most in demand. Inquiry was made into a variety of specific complaints, and they were explained to the satisfaction of the committees. A vote of confidence in the efforts Mr. Walton is making for the accommodation of those attending the conventions was passed.

Another Gorgeous Private Car.

The "genial, gentlemanly and affable" Superintendent Michaels of the Northern Pacific arrived in this city yesterday, says the Winnipeg *Tribune*, in his "private car" which has been elaborately fitted up for his own special use. It is said to be one of the finest cars at present on wheels. The fittings are elaborate and are of the most superlatively luxurious order. True, the car was once used for the plebeian work of carrying baggage, but one of the yard carpenters took it in hand, put up a board partition so that the superintendent might be able to retire from the gaze of common mankind, develop "in silence and alone" schemes for the furtherance of the company's great international interests, and if necessary pop out from his seclusion at odd times and "drop onto" any employé who may not be happening to do his duty. It is announced with considerable eclat (with accent on the t) that this "palace on wheels" may be inspected by an eager public from time to time when it is not in active service. The public can find it somewhere about the yard. Care must be taken that it is not mistaken for one of those red cabooses. It is painted a dirty mud color. A few people who were fortunate enough to be at the station last night when the train came in got a full view of the "palace." Some thought it disfigured the appearance of the train. It has been most appropriately named the "Michael Angelo," partly after the great sculptor and partly after the other great Michael.

An Irregular Pass.

Colonel Williams was for several years general manager of a railroad in Florida. He was a pushing, energetic officer, with an eye and word in every detail of railroad work, and he was also noted for the lamentable scragginess of his handwriting. Nevertheless, it seemed as if no one was justified in doing anything without a written order from the Colonel.

A small farmer named Sturgis began riding over the road on a pass which the conductors read: "Conductors, pass Farmer Sturgis over the road any time he wants to." The farmer, after a time, began to prove a nuisance, for he made periodical trips to Tallahassee and returned drunk every time, making himself obnoxious to the passengers. One day Conductor Brown, who had got tired of looking after Sturgis, complained about him to Colonel Williams, and suggested that the unlimited pass should be taken away.

"Unlimited pass," said the general manager, "I never gave that man a pass. Take it up the next time he gets on the train and collect fare."

This was done the next time that Sturgis wanted to go to Tallahassee, and the conductor carried the pass triumphantly to Colonel Williams. There could be no doubt of the handwriting, or of the signature, and the conductor, holding up the paper to his chief officer, read, "Conductors, pass Farmer Sturgis over the road any time he wants to."

"Let me see that paper," said the Colonel. "Why, you blockhead, that reads, 'Conductors and engineers, take a supply of wood from this man any time you want it.'" The man had used that order as a pass for six months.

A Rotary Circulating Sleeper.

"The most important problem in car construction at the present day," said Mr. T. A. Bissell, Superintendent of the Wagner Car Works, as he perfumed the rotunda of the Murray Hill Hotel with a Buffalo-made Havana, "is the designing of a sleeper that will give every person a lower middle berth. You have all heard about the Scotch genius who built a house and dining table which placed each of his seven sons at the head of the table. Now I am going to improve on that idea. I am going to build a sleeping car with 24 double berths and every applicant will have the lower middle berth."

"That will be worth going to the World's Fair to ride in," said Lentz. "How are are you going to make it?" "Well," said Bissell, "I have not got all the details worked out, but I have in my mind a car designed with the berths arranged in a spherical form with rotary-circulating attachments. A passenger comes in and takes the middle lower berth. When he is ready for retiring his berth is in the lower middle, and as soon as he gets inside the porter moves an electric motor which sends the occupied berth to the top and end; then all the passengers will be accommodated in a similar fashion. It is going to be very chilly weather about World's Fair times if the Wagner Company fails to give its patrons everything they want."

By next October the shops at Point St. Charles, Que., will be building 10 new cars, similar to those run on the elevated roads in New York, for the new belt line at Toronto.

The Jackson & Sharp Company are building 10 first-class coaches for the Chicago & West Michigan Railway. The cars are to be finished in antique oak, with Scarritt seats covered in blue plush.

"Who held the pass of Thermopylæ against the Persian host?" demanded the teacher. And the editor's boy at the foot of the class said: "Father, I reckon; he holds a pass on every road in the country that runs a passenger train."

S. W. Elliott, Superintendent of the car department of the Holt Brothers' manufactory, Stockton, Cal., has closed a contract with the Oakland & Berkeley Rapid Transit Company to build four open electric cars, to be run on the new road between Oakland and Berkeley.

"You'll have to pay half fare for that boy, madam," said a conductor. "He is certainly over five years old."

"Indeed he isn't," replied the passenger. "I have taken that child free for over six years, I'd have you understand, and I don't intend to begin paying fare for him now."

The Wason Car Manufacturing Company, Brightwood, Mass., has orders for 101 passenger cars, to be delivered during the next five months to the following railroads: 22 to the Old Colony, 50 to the Manhattan (elevated), 20 to the New York, New Haven & Hartford, and nine to the Los Angeles Terminal.

Cushing's Drawbar Attachment.

The Cushing drawbar attachment is the result of several years of experimenting on the Philadelphia & Reading, and later on the Union Pacific Railway systems, culminating in the perfected form now offered to railroad companies. It is made of the very best grades of the metals employed, being produced in either steel, malleable iron or gray iron, as preferred by the purchasers. It seems apparent that in the use of the Cushing attachment, the advantage of great strength, reduction in the number of parts, the distribution and reduction of local strains, a superior device has been offered. It has been found in practical service to be of substantial benefit in obviating undue expense in repairs of cars at inspection and terminal points, as also the consequent delays to cars in transit, and the great number usually held out of service by reason of these repairs. One-half of the ordinary repairs at inspection and terminal points are due to defect in the draft rigging of cars; and the extensive use of the Cushing attachment has reduced this defect 50 per cent. on the system of roads where the device is extensively used. The attachment is reversible and interchangeable, adapted to spring pocket and tail bolt, is simple and inexpensive and may be applied in substitution of the ordinary drawbar stop without any variation of the general plans of cars or alterations of either members of the draft apparatus, and in repairs the old followers and springs may be used in connection with this device. Its construction obviates the necessity of removal of the attachment plates in case of the necessary repairs to drawbar, followers or springs; at the same time it affords entire safety in case of derangement of any of these parts while the cars are in transit; a feature which practical men may consider important. The dimensions of the attachment in any respect will be made to conform to any situation of draft gear used. The device is sold by Frank Bakeman & Co., Chicago, Ill.

The Cleveland Twist Drill Company writes: It may interest your readers to know that we have just let a contract for an extension to our building, and by June 1 we will have increased our building by an addition of 115 ft. × 40, three stories high, which we propose to fill with machinery as rapidly as it can be gotten out. We are forced to this large extension of our plant by the rapidly growing demand for our drills, which are, and always have been, first-class.

The Delaware, Lackawanna & Western speak highly of the Dixon pipe grease for making mud plugs come out easy.

Joel H. Hills, general agent of the Granular Metal Company, has removed his office to 237 Franklin street, Boston, where he would be pleased to see his friends.

The Safety Car Heating and Lighting Company, New York, have published a pamphlet containing the opinions of prominent railroad men respecting steam couplers. They all write very favorably about the merits of the Gibbs coupler.

The fame of the Colliau Cupola, manufactured exclusively by Byram & Co., Detroit, Mich., U. S. A., has extended across the sea, Messrs. Byram & Co. having received recently an order for one of their furnaces complete, for shipment to England.

There is no uncertainty about the conveniences and advantages of the recent ideas of the Egan Company, Cincinnati, O. They are the most advanced machines for railway work, having been designed to save the largest amount of time and labor. No shop is complete without them.

The train which carried the President to the South and to California and is now returning by the way of the Northern Pacific is made up of Pullman cars which have been in use on the Pennsylvania road. The train uses the Consolidated Car-Heating Company's Sewall coupler and other appliances.

The Pennsylvania and the Baltimore & Ohio roads have been using the Pancoast ærator car for the transportation of fruit, and its success in keeping the load in good condition is highly spoken of. By a special form of ventilator the car keeps constantly changing the atmosphere in contact with the load, with the result that fruit comes through in extraordinary good condition.

The Phœnix Steel Wire Broom and Brush Company, of Chicago, Ill., manufacturers of locomotive track brooms and wire brushes generally, have removed their works to 43 and 45 Franklin street, where they have much better facilities for manufacturing their goods, their old factory on Randolph street, occupied by them for a number of years, having been destroyed by fire. This firm was established in 1860.

The Fitchburg Railroad Company have recently issued a handsome book giving a list of summer excursions, with a description of the principal places of interest on the line of their road. This should be read by those contemplating a trip over this very beautiful and picturesque route between Boston and the Adirondacks via the celebrated Hoosac Tunnel. A copy can be obtained from the passenger department.

The Congdon Brake Shoe Company, Chicago, says: "Please correct a mistake occurring in the last sentence of your description of the new Michigan Central passenger cars in your May issue. You have described them as equipped with steel brakeshoes, while, in fact, these cars, in accordance with the Michigan Central standard, are all equipped with the Ross brakeshoes made out of manganese iron and supplied by this company."

The old reliable Baker Car Heater Company have gotten out a fine catalogue, showing some of the latest improvements in their heaters worked out with a view to make this popular means of car-heating as safe as it is reliable. The catalogue forms a convenient handbook of the perfected Baker heater, and ought to be in the hands of the men in charge. They can be had free of charge on application to the Baker Car-Heater Company, New York.

The Master Mechanics who once use Otley's packing cement never have use for any other. It is used for making all sorts of joints, and makes a much better and more durable job than red lead or any kind of putty. It is made from a highly refractory material which is not affected by heat, and no amount of vibration can loosen its hold. Those wishing to try this cement can obtain a sample by applying at 95 Ashland Block, Chicago.

The New Hale & Kilburn car seat has been specified on most of the cars that have been ordered during the past six weeks, among them are 40 for the Baltimore & Ohio, for the Newport News & Mississippi Valley, East Tennessee, Virginia & Georgia, Western New York & Pennsylvania, St. Paul & Duluth, Minneapolis & St. Louis, Michigan Central, Chesapeake & Ohio, Chicago & Eastern Illinois and others. This is not counting about 200 coaches they are building with their celebrated rattan seating on the various elevated and suburban roads.

The Westinghouse engine has been applied very successfully to the operating of machinery arranged for unloading coal vessels rapidly. The engine continues to grow in popularity, especially in establishments where the power is widely distributed. They are also meeting with an active demand for their new specialty, known as the steam loop, having entered orders for a large number of systems from the Dunnell Manufacturing Company; Flint and Pocasset Mills at, Fall River; Forest Paper Company, of Yarmouthville, Me.; the Grosvenor Dale and Peace Dale Mills; Woonsocket Rubber Company, and others.

We have received from the Q. & C. Co. an illustrated catalogue of the railroad specialties they handle. Among the attachments of railroad cars shown in the catalogue are the Dunham car door; the Q. & C. trolley car doors, of several different forms; the Servis tie plate, the Davies locking spike, the Keystone car replacer, and other devices. An interesting attachment is the automatic brake adjuster, which is placed on car brakes to take up the slack caused by the wear of brake shoes. The adjuster is shown attached to the brake lever, and it looks very neat. Those who are using this adjuster say that it fills a long-felt want in connection with brakes, and insures the brake being in working order as long as the shoes last.

The Brown & Sharpe Manufacturing Company, Providence, have issued a new illustrated catalogue. The principal additions this year are: No. 4, plain milling machine; No. 1, vertical chucking machine; No. 5, automatic gear cutting machine, polishing wheel stand, soda kettle, test indicator, centrifugal water pump, vertical feed for No. 1 universal and No. 6 plain milling machines, new arbors for milling machines, new sizes of collets for milling machines, new size die holder, new sizes milling cutters, new sizes metal slitting saws, new standard and special spur gears, special bevel gear patterns, micrometer caliper for measuring the depth of screw threads, micrometer caliper No. 21. The catalogues are mailed to any address without charge upon appl cation.

The Eureka Tempered Copper Company, of North East, Pa., report large orders during the last 30 days from the Edison General Electric Company, of Schenectady, N. Y., from the Wenstrom Consolidated Dynamo and Motor Company, Electro-Dynamic Company, Wightman Electric Manufacturing Company, Supply Manufacturing Company, Thomson-Houston Electric Company, Sperry Electric Mining and Machine Company, Baxter Electric Motor Company, C. & C. Electric Motor Company, La Roche Electrical Works, McDonough Manufacturing Company, Shaw Electric Crane Company, Thomson Electric Welding Company, Colburn Electric Manufacturing Company, Ford & Washburn Electric Company, together with a large number of orders for railroad bearings, and, even with the dullness now pervading in business circles, the demand for their tempered copper has constantly increased instead of diminished.

The Thurmond M. C. B. Coupler.

This coupler having fully demonstrated the valuable improvements made some 16 months ago, has now one of the simplest and most serviceable devices of the car-builder type. This company were awarded the decisions and patents covering the feature of tongue and groove or arc-shaped flanger on the knuckle and in the drawhead, whereby the drawing and buffing strain is taken from the pivot pin. This feature is a vital and valuable one to this type of coupler, as this construction tends to materally strengthen the coupler. A recent test made on Fairbanks & Co.'s testing machine—without using the pivot pin—registered a tensile strain of 150,240 pounds.

This coupler consists of but three special parts, so combined as to perform several functions, viz., the automatic set, of lock, to enable uncoupling in the absence of brakeman; the curve notch, permitting coupling on the sharpest curves. The lock requires no bolt or cutter pin to keep it in place, as it cannot be removed so long as the knuckle and pivot pin are in place. As an emergency coupler it is unequaled, it having three seperate places which can be used for link-and-pin coupling, viz., the link mouth in knuckle, the pivot pin, and by using the pivot pin in the lock chamber. The knuckle is so pivoted in the drawhead that no blow can force it back, while any luffing blow will close it. The oval mouth in the knuckle affords a proper play for the link, instead of wedging it in square-shaped opening. The drawhead and lock are so formed as not to collect cinders or ice or snow. A modification of the coupler for tenders is a solid steel hook, which is pivoted to a socket-face plate.

Our Directory.

Buffalo, Rochester & Pittsburgh.—W. J. Reilly has been appointed purchasing agent.

Charleston, Cincinnati & Chicago.—W. J. Wilcox has been appointed master mechanic.

Chesapeake & Ohio.—J. A. Quinn has been appointed master mechanic of Clifton Forge shops.

Chicago, Milwaukee & St. Paul.—W. G. Collins, superintendent, has resigned.

Chicago and Northwestern.—B. Malloy has been appointed master mechanic of the Wisconsin division.

Cincinnati, Hamilton & Dayton.—R. B. Turner has been appointed superintendent Cincinnati division, vice J. L. Orbison, resigned. J. E. Gimperling has been appointed superintendent at Dayton, O.

Cincinnati, Wabash & Michigan.—C. H. Doebler has been appointed master mechanic.

Flint & Pere Marquette.—General J. M. Corse has been elected general manager.

Gulf, Colorado & Santa Fè.—C. S. Hayden has been appointed superintendent of Southern division, vice L. D. V. Van Vliet, resigned.

Kentucky & Indiana Bridge.—J. Newhouse has been appointed master mechanic of the shops at Louisville, Ky.

Mohawk Valley & Northern.—Angus Sinclair is appointed master mechanic.

Norfolk & Western.—R. H. Soule has been appointed superintendent of motive power, vice S. B. Haupt, resigned.

New York Central & Hudson River.—J. H. Phyfe has been appointed superintendent Harlem division, vice C. L. Rossiter. F. A. Harrington has been appointed superintendent of Mohawk division, vice C. M. Bissell resigned.

New York, Lake Erie & Western.—W. W. Stearns, superintendent Eastern division, has resigned.

Sinnemahoning Valley.—W. H. Badger is dead.

Toledo, Ann Arbor & North Michigan.—F. S. Chandler has been appointed purchasing agent at Toledo, O.

Union Pacific.—Mr. Sprague has been appointed master mechanic Colorado division, vice M. F. Egan transferred to be assistant superintendent Colorado division.

Employment Wanted.

WANTED—A Coach and Engine Painter, who has had thirteen years' experience as foreman, wishes to find a position. Best of references as to ability, sobriety, etc. Apply to H. J. T., office of this paper.

NATIONAL CAR AND LOCOMOTIVE BUILDER

JULY, 1891.

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The Merchants' Despatch Co. are in the market for 1,200 cars.

The Wisconsin Central are asking bids for 500 freight cars.

The Chicago & Eastern Illinois are asking for bids on 500 freight cars.

The Chicago & Eastern Illinois are in the market for some new suburban equipment.

The Central Vermont have placed an order with Wasons for eight first-class coaches.

Mr. W. H. Truesdale, president and receiver of the Minneapolis & St. Louis, has resigned.

It is reported that the cars for the Chicago Elevated Railroad have been placed with Pullman.

There is talk of the Buffalo, Rochester & Pittsburgh ordering 500 new freight cars and some heavy locomotives.

The Laconia Car Company is in receipt of an order for 200 dump cars from the Boston & Maine Railroad Company.

The East Tennessee, Virginia & Georgia have ordered cars from Pullman to make up five complete of six cars each.

The Western Railway Club is wrestling with the problem of devising a plan of joint car inspection for the roads running into Chicago.

The Chicago & Northwestern have ordered a new hard-coal switching engine, to be employed about the Wells Street station in Chicago.

Mr. Robert Miller has been appointed foreman of the Union Pacific shops at Sydney, Neb. Mr. Miller was previously an engineer on the road.

The contract for building the machine shops of the Norfolk & Western Railroad Company, at Shenandoah, Va., has been awarded. The amount is $50,000.

Mr. W. M. Apps has resigned the position of master car builder of the Western of Alabama, to accept a similar position with the Chicago & Eastern Illinois.

The Michigan Central Company are building a large greenhouse at Niles, Mich., to raise flowers for supplying dining cars and palace cars with that attractive luxury.

The directors of the New York, New Haven & Hartford Railroad were tried last month in New York for heating their cars with stoves contrary to law, and all were acquitted.

Mr. Edward Ellis has been elected president of the Schenectady Locomotive Works to succeed his brother, Mr. C. G. Ellis, deceased. Mr. Wm. Ellis has been elected Treasurer.

Mr. Robert Hardie, who was for some years superintendent of the New York Locomotive Works, has accepted the position of superintendent of Fraser & Chalmers' works, in Chicago.

Secretary Sinclair attempted to get President Harrison to open the Railway Master Mechanics' Association, and the President would have done so had his business enabled him to get to Cape May in time.

The Buffalo, Rochester & Pittsburgh have lately bought $30,000 worth of new tools, mostly for car and locomotive repairs. They are going to make large additions to their repair shops in the near future.

The Chicago, Milwaukee & St. Paul company are going at once to build a 40-stall roundhouse addition to their shops at West Milwaukee. The present roundhouse will be used for doing heavy running repairs.

The Chicago & Eastern Illinois people are determined to have business, no matter what principles may be violated in getting it. They have been caught with 166 passengers booked as attendants of stock on one train of 12 cars. The talk now is of "mixed car loads" consisting of stock and passengers.

The New York Central has ordered from Schenectedy several double-header suburban locomotives. The engine part is like a mogul and the back part is carried by a six-wheel truck, the whole being supported by continuous frames. It is the intention to burn hard coal in the engines. Two of them will be compounded.

It is stated that the La Fayette Car Works, La Fayette, Ind., have decided to remove the La Fayette branch to Lima, O., where there is already a branch, and that the two works will be united under the name of the Ohio Car Manufacturing Company, and that a department for the manufacture of coaches will be added.

The American Society of Mechanical Engineers held its twenty-third meeting at Providence, R. I., beginning June 16. Papers were read on a variety of subjects, and considerable time was devoted to visiting the manufacturing establishments in the neighborhood. None of the questions discussed were of special interest to railroad men.

One of the most attractive displays seen at Cape May during the conventions was the passenger cars lighted by the Frost system. A great many visitors went to the station to see the lights and warm expressions of admiration were heard on all sides. Many of those who saw the cars declared they were the best lighted cars they had ever seen.

A baggage master on the Hudson River Railroad collared Jay Gould at the Irvington Station the other morning and jerked him several yards away from where he was standing. As he, by this means, saved Mr. Gould's life, a belated express thundering past just as his heels cleared the track, the man will hardly lose his place. But Mr. Gould came near losing his.

The receivers of the Huntington (Pa.) Car Manufacturing Company having filed their final account with the court, were discharged from further duty. The works will now be operated by the Iron Car Equipment Company, of New York. The present company has a very large order for new cars, and it is expected an impetus will be given to the business of the concern.

The new car shops of the Chicago, Milwaukee & St. Paul, at West Milwaukee, Wis., are about ready for operation. The latest addition consists of wood-working department 7×110 feet, and the erecting department, 110×402 feet. The new addition increases the capacity of the works from four to ten box cars daily, and gives employment to 300 additional men.

American trainmen may always be depended upon to find appropriate names for any form of engine or car that presents departures from the accepted form. There are on the Atchison, Topeka & Santa Fe a lot of engines with wheels about 30 inches diameter, and a stroke so long that the crank pins are almost on the rim of the wheel. The men call these engines the fanning mills.

The publishing of daily reports of the proceedings of the railroad mechanical conventions by the *Northwestern Railroader* has become a highly popular feature of the meetings. Both associatians at the Cape May conventions passed resolutions of thanks to the proprietors of the paper for their enterprise in publishing the proceedings daily, and the individual thanks were no less cordial.

During the discussion of the rules of interchange of cars at the last convention a member related particulars of a case where he had violated the rules by repairing a foreign car with wrong material, and he felt aggrieved because the owners of the car only allowed him the cost of scrap for the oil boxes put in. He had no right to anything else and the case was by no means creditable to the narrator.

The Richmond Locomotive Works are building ten 10-wheel locomotives with 19 ×24-inch cylinders for the Chesapeake & Ohio; two 8-wheel passenger engines with 18 × 24-inch cylinders, seven 17 × 24-inch 10-wheel engines and one 17 × 24 switching engine for the Louisville Southern four 8-wheel locomotives with 18 × 24-inch cylinders for the Seaboard Air Line, and two engines for the Wilmington, Onslow & North Carolina.

New York is credited with having the shortest street railway in the world. We refers to the road that begins at Eighty-fifth street and Fifth avenue and ends at Eighty-sixth street and Central Park west, less than half a mile. Its equipment is two small cars and two horses. Two conductors and two drivers man the road, and the fare is five cents, as much as on the elevated or the other horse-car lines from the Battery to Harlem, ten miles.

We hate to miss a good thing, and that is how we feel particularly sad because tyrant circumstances prevents us from accepting an invitation sent us by Mr. D. Pratt Wright, vice-president of the Berkley Springs & Potomac Railroad to be present at a grand tournament and ox roast on July 4. We hope the ox will be as tender as the hearts of those who invited us, and that the tournament part will wash the substantials down many happy receptive throats.

A passenger conductor who has been employed for the last twenty-five years on the Chicago, Rock Island & Pacific, and who has borne a spotless reputation, was recently discharged without a hearing. Some of the officers say that he failed to account for a fare collected, and the superintendent of his division says he is a labor agitator, although others say that he did not belong to any labor organization. It is hardly surprising that labor organizations wax stronger every year.

The Committee of Science and the Arts of the Franklin Institute has recommended the award to Mr. S. M. Vauclain, of the Baldwin Locomotive Works, of the Elliott Cresson medal for his compound locomotive and of the John Scott legacy premium and medal for his improvement in the manufacture of forged wheels. These, it will be noted, are the recommendations of the committee. The award is made by the Institute after the recommendations have been advertised for three months.

Mr. Andrew Carnegie, the well-known steel maker, is spending the summer at Cluny Castle, in Scotland, where he and his charming wife are said to be highly popular, a rare thing with strangers occupying the old clan residences in the Highlands. Mr. Carnegie gives a grand fête on the fourth of July, at which the natives from far and wide are invited to partake of hearty Highland cheer. A scheme of Mrs. Carnegie's for this year is to give all the young girls a doll and every boy a knife, while the older folks are each given a suitable present as a memento of the great American holiday.

Peter A. Short, who is in jail in Sacramento, Cal., has a record as a man with a mania for stealing locomotives. About two years ago he stole an engine out of the Portland (Ore.) yard and ran it to Oregon City before he was captured. The track was kept clear by telegraph. He escaped and next appeared at Sacramento, where he indulged in a precisely similar break. Last December there was a bad wreck at Fresno, which cost two lives. It was traced to a runaway engine, and Short was the man in charge. A reward of $2,000 was offered for him by the railroad people, who propose to put him in State prison.

Far away Vancouver is excited over the invention of a car coupler by one of its citizens, Mr. George Cassady. The inventor was recently interviewed by a representative of the press, and his views on car couplers were vouchsafed the most prominent place on the front page of the paper. From the description, which is as vague as the usual productions of the ordinary reporter when he deals with mechanical matters, we infer that the coupler is an improvement on the link and pin head. A distinct point made is that the coupler provides for as much slack as the common drawbar has. This is not a lucrative period for inventors of link and pin types of couplers and we would advise inventor Cassady not to spend much on his coupler.

During the discussion that followed the report on Lettering Freight Cars at the Master Car Builders' Convention, Mr. C. A. Schroyer, of the Chicago & Northwestern, made the statement that the general officers of his company regulated the lettering of cars. The question was then frequently asked among the members, "What duties does the operative department of that road leave to the car department?" If general officers would direct more attention to securing results, and permit the heads of departments to attend to details, better and more economical service would be secured. When the president or manager attempts to direct minute details there are certain to be many important things neglected which represent serious increase of expense.

The doctrines of trade protection appear to have many followers in China. The adhesion to these principles is said to have prevented the importation of a locomotive to operate a railroad that was built there lately in connection with coal mines. An engineer in charge of the line got over the first hurdle of the obstruction to progress by building a locomotive of odds and ends as they could be picked up in the Celestial Empire. The boiler belonged to a portable winding machine. The wheels were twenty inch, Whitney chilled weeels, which had been bought as scrap castings, and the frames were made of channel iron. Before this was finished its preparation became known, and orders were issued that it should be stopped. After delay of a year or two, when there was time to see all the politicians, and when no one could show a precedent for stopping the running of a native built locomotive, they were permitted to put the engine to work. Those interested in the railroad say there is little doubt that if this engine had not been built as it was in China and by native workmen it would never have been allowed to run, and the use of locomotives would have been postponed for many years.

Master Car Builders' Convention.

The twenty-fifth annual convention of the Master Car Builders' Association was called to order by President Kirby, at the Stockton Hotel, Cape May, on June 9, at 10 A. M.

The roll call showed that the following members were present: J. H. Agnew, Thos. Anderson, J. C. Barber, J. N. Barr, R. Biester, T. A. Bissell, R. C. Blackall, C. Blackwell, J. J. Bossinger, H. C. Bossinger, H. Boutet, E. D. Bronner R. W. Bushnell, C. F. Butler, E. T. Carlton, H. Carlton, W. K. Carr, M. T. Carson, F. D. Casanave, T. Cassidy, E. Chamberlain, J. T. Chamberlain, J. J. Connolly, J. S. Cook, W. Cormack, C. H. Cory, J. Cowan, A. J. Cromwell, J. H. Davis, W. H. Day, G. W. Demerest, J. F. Divine, A. Dolbeer, T. Downing, O. P. Dunbar, T. G. Duncan, G. W. Ettinger, J. P. Fletcher, Wm. Forsyth, M. A. Garrett, W. Garstang, Geo. Gibbs, E. W. Grieves, Fred Griffiths, A. Griggs, F. O. Groves, Geo. Hackett, W. H. Harrison, D. Hawksworth, J. J. Hennessey, Robt. Hitchcock, J. Hodge, W. L. Hoffecker, J. M. Holt, S. Irvin, Jacob Johann, Isaac Keith, John Kirby, P. Leeds, J. T. Layton, J. S. Lentz, W. H. Lewis, T. Lindsay, J. McGee, Robt. McKenna, W. McWood, Jas. McBeth, John Mackenzie, J. W. Marden, R. E. Marshall, M. M. Martin, Jas. Meehan, J. N. Mileham, Thos. Millen, E. T. Nelson, L. B. Paxson, G. C. Payne, P. H. Peck, S. Porcher, H. L. Preston, John H. Rankin, G. W. Rhodes, D. C. Richardson, W. J. Robertson, W. Rutherford, Ch. A. Schroyer, E. T. Silvius, Angus Sinclair, C. A. Smith, W. T. Smith, T. B. Stewart, F. A. Stivard, T. Sutherland, J. Townsend, W. H. Trainham, W. F. Turreff, John Voorhees, A. M. Waite, E. B. Wall, F. M. Wallis, H. A. Webster, B. Welsh, G. W. West, E. A. Williams, J. E. Wood.

An address of welcome was delivered by the mayor of the city.

President Kirby then delivered his opening address, which was of a highly practical character. He deplored the great diversity of forms in the M. C. B. type of car coupler that are coming into use, and favored the making of an effort to restrict the number of patterns. The knuckle, which is the part most liable to breakage, ought to be interchangeable, and the uncoupling devices uniform.

The excessive use of the defect card was deprecated. There is a tendency on some roads to load bad-order cars and card them for others to do the repairs. The practice of some inspectors of adding defects to a card that were not on the original was spoken of as nothing less than forgery.

The growing tendency to appeal every dispute that arises under the interchange rules to the Arbitration Committee was adverted on. During the last year 48 cases had been submitted to arbitration, and most of them ought to have been settled by the parties interested.

That tendency toward distinct individuality which so frequently induces car builders to design something which shall be different from that used by others, was spoken of, and its effects pointed out. Crippled cars were often held for weeks waiting for material that has to be supplied by the owners merely because the master car builder liked to have something different from that used by his neighbors. By way of an example Mr. Kirby referred to the Christie brakehead which was adopted to secure uniformity. While the shoes may be interchangeable the brakeheads are far from being so, the different kind of beams used and the various methods of hanging preventing the heads from being interchangeable. The same thing is true of the oil box for 60,000-pound cars, the distance between bolt holes varying from 8 to 9½ inches.

The report of Secretary Cloud showed that there were 278 members of the association, an increase of 14 over the roll of last year.

Mr. H. G. Prout and Mr. D. L. Barnes were elected associate members.

COMMITTEES.

The president early in the first session appointed the following committees:

Nominating: William F. Turreff, R. H. Wilbur, Benjamin Welsh, W. McWood, E. B. Wall.

Subjects for next year: F. D. Adams, E. Chamberlain, J. N. Barr, W. Forsyth, J. Mackenzie.

Resolutions: W. H. Day, T. Sutherland.

Auditing: E. S. Brouner, E. S. Nelson, G. W. Rhodes.

BRINGING CONVENTIONS CLOSER TOGETHER.

Mr. F. D. Adams read the resolutions adopted by the joint committee of the Master Car Builders' and the Master Mechanics' associations appointed to devise means of bringing the conventions closer together. The plan is for the Master Car Builders' convention to meet on the second Wednesday in June, and that the Master Mechanics' convention meet on the following Monday. The place of meeting to be settled by a joint committee, consisting of the president, three vice-presidents and secretary of the Master Car Builders' Association and the Executive Committee of the Master Mechanics' Association. After some discussion the plan was adopted by the association.

The first paper read was on

LETTERING FREIGHT CARS.

The following are the principal portion of the above report, which was prepared by E. W. Grieves, G. W. Demarest and R. D. Wade:

BOX CARS.

1st. The half of the side of the car on which the doors do not slide should show the name of the railroad company, with the number of car immediately below it, and it is preferable that the name be spelled out in full, but if abbreviations are used they should be such as to clearly indicate the name of the road. When initials only are used, it is urged that the name appear in full below the number in letters not over four inches high. When necessary in order to present the full name of the railroad company, two lines should be used, as shown. The letters and figures for this marking should be seven to nine inches high. The light weight of the car, with such other information as is necessary in connection therewith, should be placed below the number of car, near the sill, using letters and figures three or four inches high.

2d. The half of the side of the car on which the doors slide should be reserved for trademarks when used, also for marking air brake and Master Car Builders' standard coupler when cars are so equipped and marked, or for any other special marking; the capacity of car, and, if so desired, the size of journal to be placed on this half of car, near the sill, using letters and figures 3 or 4 inches high.

3d. The side doors on each side of car should be marked near the top with the initials of railroad company, using letters 4 or 5 inches high; the initials and number of car should be marked on the inside of car over the door opening.

4th. Each end of the car should be marked near the top on the right-hand side, facing the end of car, with the initials of railroad company and number of car, using letters and figures 4 or 5 inches high.

STOCK CARS.

5th. On the half of the side of car on which doors do not slide it is preferable, rather than to place the marking on the slatting, that a board be placed, extending from the corner post to one of the body posts, sufficiently long to contain the name of the railroad company, or, if necessary in order to give the full name of the railroad company, two boards may be used, the number appearing on the third board below, in the same manner as explained for box cars, using letters and figures of the same size as for box cars. If abbreviations or initials only are used, the same directions should be followed as are given for box cars. The light weight of the car, with such other necessary information, should be placed on the side sill, using letters and figures 3 or 4 inches high.

6th. Suitable boards should be placed on the half of the side of car on which doors slide, for any marking that may be desired, such as trademarks, air brakes, Master Car-Builders' standard coupler, etc.; the capacity of car, and, if so desired, the size of journal, should be placed on the side sill on this half of the car, using letters and figures 3 or 4 inches high.

7th. The side door on each side of car should be marked on the top rail with the initials of the railroad company, using letters 4 or 5 inches high. The initials and number of car should be marked inside over the door opening.

8th. Each end of car should be marked on the slatting with the initials of road and number of car, using letters and figures of some size as for box cars. If the initials cannot be gotten on the slatting, a board should be used, fastened on the right-hand side when facing the end of car.

GONDOLA CARS.

9th. Gondola cars should be marked on the side near one end of car with the name of railroad company and number of car immediately below it, using letters and figures six to nine inches high. It is preferable that the name be spelled out in full; but, if abbreviations are used, they should be such as to clearly indicate the name of the road. If initials are used, it is urged that immediately below the number the full name of the railroad company should appear in letters not over four inches high. When necessary in order to present the full name of the road, two lines may be used as shown. Any other marking desired, such as trademarks, air brakes, Master Car Builders' standard coupler, etc., should be placed near the opposite end of car. The initials of road, followed by number of car, should be placed on the side sill, near the center of car, for use in case the side planks are removed. The light weight of the car, with such other necessary information, should be placed on the side sill below the number, using letters and figures three or four inches high. The capacity of car, and, if so desired, the size of journal, should be placed on the side sill at the opposite end of car, using letters and figures three or four inches high.

10th. When cars have stationary ends, the initials of railroad company and number of car should be marked on each end near the top, at the right-hand side when facing the end of car, using letters and figures the same size as for box cars.

FLAT CARS.

11th. Flat cars should be marked on the side sill, near the center of car, with the name of the railroad company, followed by the number of car, the size of letters and figures to be as large as can be used to advantage. Where possible, the name of the road should be spelled out in full, or, if abbreviations are used, they should be such as to clearly indicate the name of the road, but if only initials are used the full name should appear in smaller letters. The light weight of the car, with such other necessary information, should be placed near one end of the car; the capacity of car and, if so desired, the size of journal should be placed near the opposite end, using letters and figures the same size as for gondola cars. Any other marking that may be desired, such as trademarks, air brakes, Master Car Builders' standard coupler, etc., should be placed in the most available space on the side sill.

GENERAL.

12th. Open cars of all other types not herein provided for should be marked as near like the marking described for gondola cars as the construction of such cars will admit, excepting that it may not be necessary to place the initials of railroad and number of car on the side sill.

13th. A portion of the outside intermediate sill under all cars, preferably near the center of car, should be painted with brown or black paint, and on this space the initials of road and number of car to be stenciled in white, using letters and figures 3 or 4 inches high.

14th. The initial of railroad and number of car should be stenciled on both sides of wooden bolster or channel iron transom in each truck, under all cars. The size of journals should be marked on each side of truck in the most convenient

A short discussion follow ed the reading of this report which turned mostly on discrepancies between the report and the illustrations.

The next report read was as follows, on

PRESSED STEEL AND MALLEABLE IRON IN CAR CONSTRUCTION.

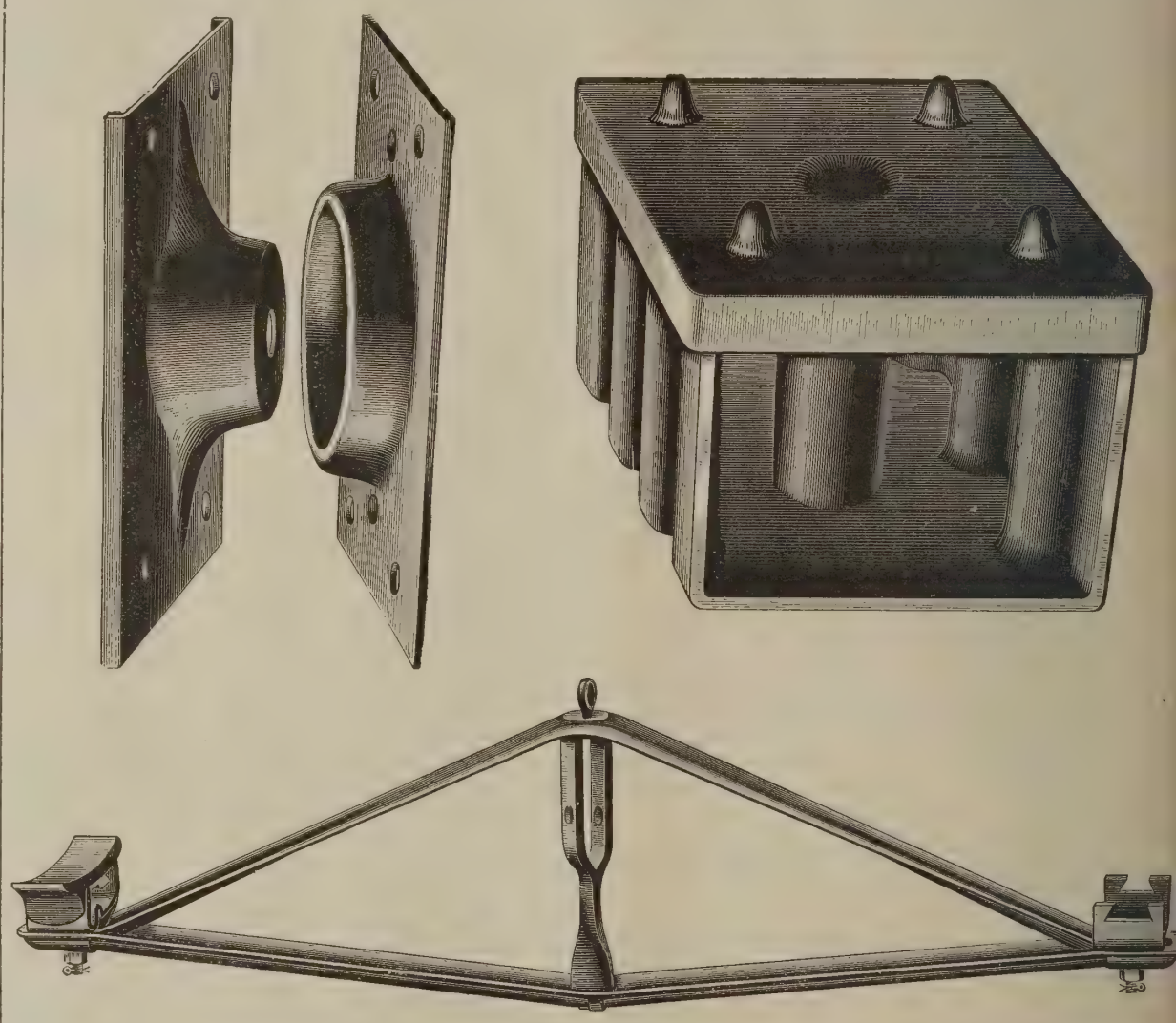
PRESSED STEEL.

Since our last report the use of pressed steel for car details has continued to increase, so that there is now about 15,000 tons of this material on cars in the United States.

In addition to the pieces already reported pressed-steel shapes are now used for post pockets, side bearings, bolster guidebars, bolster guideblocks, stakes for gondola cars, corner bands, brakebeams, door hoods, etc. Illustrations of some of these pieces are here given.

In order to prevent too great a diversity of sizes of stake pockets it is suggested that the sizes at the top should vary by ½ inches—thus: 3 × 3½ inches, 3½ × 4 inches, 3½ × 4½ inches, 3½ × 5 inches, 4 × 5 inches—and that they have a uniform taper in each direction of ¼ inch in 6 inches.

The center plate, Fig. 1, is the form which has been used



most extensively. It is preferred by manufacturers as the best form into which the steel can be pressed, and experience with this form on 25,000 cars is very satisfactory. The larger annular rib resists most of the thrust on the plate, and prevents any shearing of the center pin. The bearing surface on the bolster is made as large as possible.

Some pressed-steel plates have been made with the bottom portion at the center raised from the bolster, so that the load is carried in suspension. The constant movement of the steel plate under the variations of load has already produced rupture in a number of such plates.

For this reason, forms where the central portion has no bearing on the bolster (similar to Fig. 6 in our report of last year) are not recommended.

For cars of 60,000 pounds capacity, pressed steel centerplates should be at least ½ inch thick.

The center plate, Fig. 1, is recommended as our standard form so far as the bearing portion between center plates is concerned, leaving the width between flanges, height over all and bolt centers to be made to suit the bolsters on which they are used.

Pressed-steel freight trucks are being gradually introduced in this country, and are now in service on a number of our roads.

The weight is somewhat less than the diamond truck for 30 ton cars, and it is furnished at the same cost. The cost of material and labor in a diamond truck (exclusive of frame) is $80, and the pressed-steel frame is supplied at $45 each, making the total cost of one pressed-steel truck complete $125.

The strength of these trucks is greater than the heaviest diamond truck now made.

A shop near Chicago is now engaged in building steel freight cars, and they will soon have 25 or 30 metal cars in service.

MALLEABLE IRON.

We have nothing new to report about malleable castings in car work, except to call attention to the fact that, as the majority of the M. C. B. standard couplers are now made of this material, we should have more information as to its strength and its behavior under the severe blows to which couplers are subjected. The shape of the arms and the lugs (or ears) of this coupler make it a very weak form for a buffer; it should therefore be made of a material having the greatest resistance to shocks.

In preparing our report of last year we were unable to

get from manufacturers any definite figures on the strength of malleable iron. The statements in that report relating to the strength and resistance of malleable castings should be taken to apply only to thin sections, ¼ inch or ⅜ inch thick.

The rules given for designing patterns for malleable castings state that "the strength of the casting depends very much upon the design, and that the *strongest* portion is the outside surface." "The strongest form is a star-shaped section. For brackets, a *number of thin ribs* should be used instead of *one thick one.*"

A thin section being therefore necessary to secure superior strength in malleable castings, it seemed evident that in a casting like the M. C. B. coupler, 1 inch and 1¼ inches thick in the arms and lugs, we would not get the advantage of the high strength and ductility usually attributed to malleable iron.

This fact has such an important bearing upon the question whether malleable cast iron is the most economical material for the M. C. B. coupler that we have made some investigation of the strength of malleable castings of various thicknesses from ¼ inch up to 1⅛ inches, increasing by eighths, and we present the results below.

The samples were obtained from the National Malleable Casting Company, Chicago, and were tested at the C., B. & Q. laboratory at Aurora.

We believe the results here given are the first published tests of the strength of malleable cast iron:

TENSILE TESTS OF MALLEABLE CASTINGS.

Nominal dimensions.	Actual dimensions.	Area in square inches.	Tensile strength. Actu'l.	Tensile strength. Per square inch.	Per cent. of elongation in 4 inches.	Elastic limit. Actu'l.	Elastic limit. Per square inch.	Remarks.
In. In.	In. In.							
1½× ¼	1.52× .25	.38	13,200	34,700	2	8,000	21,100	
1½× ⅜	1.52× .39	.593	20,000	33,700	2	9,000	15,200	
1½× ½	1.53× .5	.765	25,100	32,800	2	13,000	17,000	
1½× ⅝	1.53× .64	.979	31,400	32,100	2	19,000	19,400	
2 × ¾	2 × .78	1.56	39,100	25,100	1½	24,000	15,400	
1½× ⅞	1.54× .88	1.355	45,500	33,600	1½	26,000	19,200	
1 ×1	1.06×1.02	1.08	33,000	30,600	1	19,000	17,600	
1¼×1¼	1.28×1.3	1.664	45,600	27,400	1	.....	.....	
1½×1½	1 52×1.54	2.341	66,000	28,200	1½	.....	.....	

While the results do not show any *regular* reduction of strength with increased thickness, yet it is plain that the average strength of the thin specimens is much greater than the thick ones. Thus the average strength of pieces ¼ inch thick up to ⅝ inch, inclusive, is 33,300 pounds, and of the thick pieces, ¾ inch up to 1½ inches inclusive, only 28,980 pounds, the thin specimens being 15 per cent. stronger than the thick ones.

But the most important fact brought out by these tests is the low ductility of malleable cast iron, whether *thick* or *thin.*

The specimens ¼ inch and ⅜ inch thick had an elongation of only 2 per cent. in 4 inches, and those 1 inch and 1¼ inches thick only 1 per cent. in 4 inches.

We can now give the tensile resistance and ductility of malleable cast iron as compared with that of other metals suitable for those details of cars which are subject to severe blows.

Current specifications for wrought iron require a strength of 50,000 pounds and an elongation of 20 per cent. in 4 inches.

For good cast iron, 20,000 pounds.

For steel castings 60,000 pounds and 10 per cent. elongation in 4 inches.

COMPARATIVE TENSILE RESISTANCE AND DUCTILITY OF MALLEABLE CAST IRON AND OTHER METALS.

	Ultimate strength, lbs. per square inch.	Strength rank with cast iron as unity.	Per cent. of elongation in 4″.	Ductility rank, with malleable iron as unity.
Cast iron.....	20,000	1.0	0.35	
Malleable cast iron...	32,000	1.6	2.00	
Wrought iron	50,000	2.5	20.00	10
Steel casting.....	60,000	3.0	10.00	5

WILLIAM FORSYTH,
JOHN MACKENZIE,
E. D. BRONNER, } Committee.

Mr. J. N. Barr considered the subject highly important, and wished the committee to be continued. Believed decided advances were going to be made soon in the use of steel castings, and he considered the present committee could readily secure more valuable information on the subject.

Mr. E. B. Wall moved to submit the recommendations of the committee to letter ballot.

Mr. W. Forsyth, in answer to a question put by Mr. Grieves, said that the steel center plate had been tested when first used, and as a result several thousands of them were put on cars belonging to the Philadelphia & Reading. The service with this form has been so satisfactory that it has been recommended as the best shape.

Mr. J. M. Barr opposed the sending the recommendations of the committee to letter ballot, on the grounds that the drawings were not complete enough to prevent confusion about the forms and dimensions. He also made the point that if more mature consideration were given to proposed standards before sending them to letter ballot there would be fewer of them rejected.

Secretary Cloud held that the simple recommendations of the committee would be useful and would form a guide for railroad companies to follow if they chose.

Mr. E. Chamberlain was in favor of having things that were recommended for letter ballot accompanied by drawings sufficiently plain to prevent mistakes or misunderstandings.

Mr. Grieves was anxious to have a standard center plate as soon as possible, but he believed that drawings sufficiently clear and accurate should be furnished to show railroad companies what they were voting on.

After some further discussion the report was accepted, and it was decided to appoint a committee to prepare drawings of stake pockets and center plates, with their fastenings, and to submit them next year.

The next business taken up was the reading by Mr. J. N. Barr of the report on

STEAM HEATING AND VENTILATING PASSENGER CARS

The report went on to intimate that as steam heating has come to stay, it behooves the members of the association to create and combine such devices as will insure both safety and economy in car heating.

The various well-known methods of heating cars by steam from the locomotive were commented on. Direct steam was regarded as the most economical, but regulating the temperature was difficult, and the results were often unsatisfactory.

The McElroy system, operated by the Consolidated Car Heating Company, Albany, N. Y., was briefly described, and the conclusion was that it was applied to many cars and run with considerable success.

The New York Safety Heating and Lighting Company's system was also briefly described, and said to be used with a good degree of success.

Another system was described which is worked in connection with the Baker heater.

The following principles were recommended:

1. That all pipe, as far as possible, should be located inside the car.

2. That a uniform location should be adopted for the ends of the pipe between cars.

3. That a standard pipe union or corresponding device should be adopted for connecting the rubber hose with the train pipes.

4. That means for heating cars independently should be retained.

The report was received and the committee continued. On motion of Mr. A. M. Waite, the committee was instructed to submit to next convention a standard location for the end of the steam pipe, and standard details of unions and hose connections, but omitting the coupler.

This closed the work of the first day.

DISCUSSING RULES OF INTERCHANGE OF CARS.

The second day and part of the third were devoted to discussing the rules of interchange of cars. The only important changes made were in relation to the care and repairs of air brakes. Seven new clauses were added covering this subject. They were discussed in a rather spirited fashion, but little time was wasted on the subject. There was, however, very persistent and long-winded discussions over trivial matters. Some of the members developed a tremendous objecting power during the discussion of the rules of interchange.

After the rules of interchange were disposed of on the third day Mr. G. W. Rhodes read the report on

METAL FOR BRAKESHOES.

The committee appointed to continue the investigation of this subject reported that it was necessary to make accurate and careful road tests, which called for considerable expenditure of money not available. Owing to this they recommended that the investigation be abandoned and the committee discharged.

After reading the report Mr. Rhodes gave particulars of investigations that had been made in the laboratory at Aurora in regard to metal for brakeshoes.

The committee was awarded a vote of thanks for the valuable work done.

The report was then read on

JOINT INSPECTION.

It has been frequently remarked, with much truth, in times past, by General Managers and General Superintendents, that the heads of car departments do not consider the interests of any other department of the road except their own, in the inspection and interchange of cars. This state of affairs may still exist to some extent, but an evidence of the rapid decrease of such sentiments and practice is seen by the great strides which are being made by joint inspection in superseding the old system of straight or individual inspection. In these days of low rates and sharp competition it becomes a matter of vital importance to any and all roads to do everything consistent with safety, to accept and dispatch loaded cars.

Your committee has endeavored, in the recommendations which it will make, to still more further the interests of the traffic and operating departments of the roads, and at the same time furnish proper protection to the interests of the car departments.

In a report read in May, 1890, to the Central Railway Club, the following eight requirements are set forth as being necessary in a theoretically perfect inspection and interchange of cars:

1. Avoidance of delays to freights.
2. Assurance of safety of cars to trainmen and good running condition.
3. Just placing of responsibility for defects on cars.
4. Avoidance of disputes.
5. Avoidance of transfer of freight.
6. Avoidance of setting out cars from trains, or setting back cars.
7. Economy of service.
8. Uniformity of inspection at different points.

All efforts made by our respective roads in the direction of revision of M. C. B. interchange rules, and of changes from individual inspection to joint inspection, and from one system of joint inspection to another, seem to be made in order to accomplish, as nearly as possible, the above results. From the answers to the circulars of inquiry sent out by this committee, it is found that the various systems of joint inspection in use on the roads represented by this Association, for points where there are more than two inspectors required, may be classified into three distinct systems:

1st. Where the inspection is in charge of a chief joint inspector, who hires such inspectors to do the work as he may deem necessary, the men being paid pro rata by the roads in the joint inspection, the chief joint inspector having entire charge of the inspectors, hiring and discharging them, and keeping their time.

2d. Where each road hires and instructs its own inspectors, the inspectors taking their orders from their respective car foremen, the joint inspector acting merely as an arbitrator, to settle disputes.

3d. Where each road hires its own inspectors and places them, in all matters pertaining to inspection of interchange cars, in charge of a chief joint inspector, who is held entirely responsible for the inspection at that point. The inspectors to be subject to their respective car foremen to do repair or other work when not inspecting for interchange.

It will be generally agreed that there is no system of inspection which is better calculated to assure a thorough examination of cars, and thereby safety to trainmen and good running condition, than the old system of individual inspection by each road, regardless of the others.

In view of this fact, it seems to your committee, and is borne out by the replies received, that the nearer we can remain to individual inspection, and yet avoid the delays and disputes which constantly arise, where each road inspects for itself, regardless of the others, the more perfect will be the system.

In considering the comparative advantages of the three systems mentioned, in the light of the eight requirements given above, systems No. 1 and No. 3 seem to meet all the requirements. System No. 2 meets all but one. It does nothing toward securing uniformity. Under this system a car which will pass the inspection of one of the roads will not or may not be accepted by another, as the matter of a standard for inspection is left for each car foreman to decide for himself, regardless of any other road. As the joint inspector has no authority except to settle any disputed point between two car foremen, any carelessness or excessive rigidness on the part of the inspectors of one road cannot be corrected, and the system has nothing in it to cause any constantly growing improvement. In view of the above facts your committee does not advise the adoption of this system.

In comparing systems No. 1 and No. 3 we must look at them in the light of what we have previously said, that the greatest safety to trainmen, and best assurance of good running condition of cars, is gained by keeping as closely to the old individual inspection as possible. It must be conceded that, with inspectors, if a man feels he is working for and is paid by one road he will be more careful of the interests of that particular road than if he is paid equally by two or more roads. This being the case, it is clear that the interests of the individual roads are better subserved by each road hiring and discharging its own inspectors; but in order to avoid disputes and obtain absolute uniformity of inspection by all roads in the joint inspection, all the inspectors should be governed, as to their interpretations of the M. C. B. Rules, by the instructions of one man, the chief joint inspector, as by two or more roads, the adoption of the following form of Joint Agreement and Code of Rules:

Each road to hire its own inspectors, and to place them, in all matters pertaining to inspection of interchange cars, in charge of a chief joint inspector, who shall be held entirely responsible for the inspection at that point. The inspectors to be subject to their respective car foremen to do repair or other work when not inspecting for interchange.

Particulars of the agreement and rules for joint car inspection were then given. The committee were A. M. Waite, H. McCarty, H. Middleton, W. Garstang, S. Irvin.

Mr. Casanave moved that the recommendations of the committee be sent to letter ballot. Carried.

A vote was carried to appoint a committee of seven to prepare supplementary explanations and illustrations to be submitted next year.

Next business was the reading of the report on

AIR-BRAKE STANDARDS AND INSPECTION AND CARE OF AIR BRAKES ON FREIGHT CARS.

In preparing a system of rules for the guidance of employés, in the operation and maintenance of the air brake, it became apparent to your committee, at its first meeting, that the care of the air-brake apparatus upon locomotives and upon cars could not be separated, but must be considered as a whole. In view of this condition, the American Association of Railway Master Mechanics appointed a committee, consisting of Messrs. Blackall, Stevens and Clark, to act jointly with your committee in the preparation of such a system of instructions and examination of employés, as to their duties in connection with the air-brake apparatus. All the subsequent deliberations of the committee and the material and recommendations of this report are thus due to the joint action of these two committees.

In order to ascertain to what extent the standards heretofore adopted by the Master Car Builders' Association referring to the application of the air brake to freight equipment were being used, and to ascertain if any alterations or changes in such already adopted standards were desirable, the committee sent out a circular letter of inquiry to the representatives of the different railroads, and the statistics obtained from the replies will be found tabulated.

In addition to the replies, as shown in this statement, several others were received from roads which had no air-brake equipment coming under the conditions to which the inquiries point, and which merely give an opinion as to the desirability of the use of an iron brakebeam in connection with air brakes. These replies have therefore not been included in the table.

It will be observed that since the adoption of the standards for freight-car brake gear two years ago, and up to about the 1st of March last, the roads mentioned in this table have applied the air brake, with substantially the apparatus adopted as standard by the Association, to 38,342 freight cars, and of these 38,342 freight cars 21,084 were also equipped with the metallic brakebeam.

In reply to the inquiry as to whether any form of wooden brakebeam can be made to properly serve the purpose with the use of the air brake, there are 20 replies in the negative and 9 in the affirmative.

In reply to the question as to whether an iron brakebeam is essential to the successful operation of the freight brake there are 20 replies in the affirmative, three that owing to practical difficulties in the way of the use of a suitably constructed wooden beam the iron beam is practically necessary, and six that an iron beam is not essential.

It will thus be seen that of those who consider that a wooden beam may be so constructed that it will give a satisfactory service, a portion believe that it is more desirable to use a metallic beam.

Upon investigation, therefore, of the use which has been made of the existing standards, and in the absence of any criticism as to the effectiveness of the same, your committee finds no recommendation to make in reference to any alterations in existing standards.

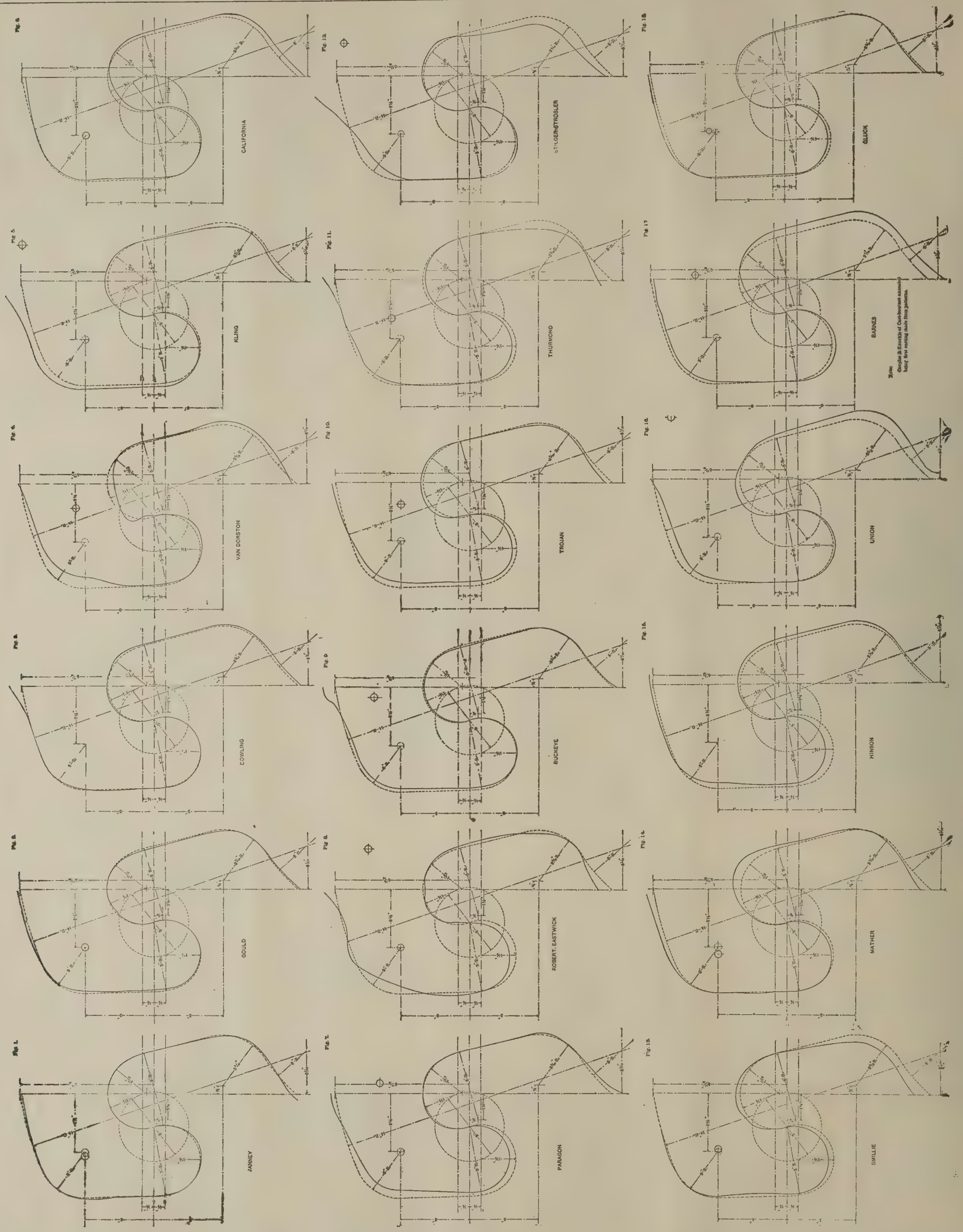
The attention of the committee has been called to some errors in the drawings accompanying the published proceedings of the Association. One of these errors refers to the placing of the brake staff upon the wrong side of the car, and the other has reference to the bracket for the dummy coupling, in which the distance from the lower end to the center of hole for securing the dummy is given as 2⅛ inches, instead of 1⅝ inches, as it should be. Your committee has rectified these errors.

In view, however, of such investigation as the committee has been able to make, and the very generally expressed sentiment that the most effective operation of the air brake can only be secured through the use of an iron brakebeam, your committee would recommend and urge the application of an iron or metallic brake beam, conforming to the requirements already specified and adopted by this Association, in all cases where the air brake is applied.

In considering the question of interchange rules as applied to the air-brake apparatus it appeared very essential to your committee that a uniform system of inspection and care of brakes, as well as a uniform method of operating the same, should be adopted upon all roads.

To secure this result your committee has prepared and presents to you herewith, to be issued in a form considered suitable for general distribution among employés, a code of rules to govern all employés of railroads who are concerned in any way with the operation, inspection or maintenance of the air-brake apparatus. It is prefaced by some general instructions, which are offered as a suggestion to general managers and other executive officials, to whom the responsibility of issuing the books would fall, and by whom they should be signed. Following are instructions to enginemen, trainmen, engine-house foremen and car inspectors.

Considerable care has been given to make these instructions applicable to all conditions, under which railroads in different portions of the country are operated, and it is believed by your committee that to secure thorough and uniform efficiency in the operation and maintenance of the air brake such a system of rules, issued under the authority of each company, is necessary. To promote familiarity with the duties devolving upon each class of employés, and to insure the possession of suitable knowledge by each, the committee has recommended in its proposed general instructions the examination of each employé in such duties as fall to him, and to insure the uniform instruction of employés



CONTOUR LINES OF 18 "M. C. B." COUPLERS COMPARED WITH THE STANDARD CONTOUR—WITH REPORT ON MAINTENANCE OF STANDARDS.

The Line Dotted is the Standard Contour.

upon all roads, the committee has prepared a system of questions and answers to cover the examination of all employés, which accompanies the rules, and which the committee recommends be printed with and form a part of the book of rules—the whole to be printed by this Association and sold to the railroads, in the same way that the rules of interchange are.

The adoption of rules of interchange of freight cars, applying to the air-brake apparatus, has been the subject of investigation, as thorough as possible, by your committee. It seems quite apparent that the time has arrived when some action must be taken by the Association in this important matter.

In offering the amendments below to the M. C. B. Code of Rules for Interchange, your committee has not recommended any particular method of testing the air-brake apparatus. There seem to be two methods by which such tests may be made, one being the use of a stationary plant at interchange points, consisting of air-pumping machinery, storage reservoirs and a system of pipes throughout the yards, with local connections, for the testing of cars at different points. The other method is the equipment of all locomotives used in switching with the air-brake apparatus, and the testing of the brakes upon cars by attaching the switching locomotive thereto. There are reasons to be given in favor of each method, and your committee does not feel warranted in undertaking to decide this question at the present time, although it would suggest that the use of switching engines for this purpose appears to be the most feasible.

The question of making charges for material and labor, in maintaining the efficiency of the air brake apparatus upon freight cars has not been incorporated in the rules recommended.

On the one hand there is a large number of roads, which have not yet commenced the equipment of their freight cars with the air brake, which would be required by the rules recommended to maintain the brakes upon cars of foreign roads in good order while upon their lines, and it would at the first glance seem that such roads should be reimbursed for any outlay in the keeping up of the apparatus. Upon the other hand, however, it is an almost universal practice now for railroads to equip all new freight engines with the air-brake apparatus, and a large number of roads, which have not already begun to equip their freight cars with the air brake, have their locomotives equipped to operate the air brake upon such foreign cars as may be in their trains, and are making a regular practice of so doing. If those roads having no freight brakes upon their cars receive foreign cars with the air-brake apparatus in good order they can make use of them upon their own line, and should be responsible for the care of them as much as if they were their own; and, as they are only required to deliver the cars with the air-brake apparatus in as good order as that in which they received it, there will be comparatively little expense to them in caring for it, unless they make use of it while on their own lines.

Your committee therefore believes that no charge to the owner of the car should be made for cleaning and oiling of the cylinder or triple valve, or the keeping of the brakeshoe slack in adjustment, any more than should be made for the oiling and care of journals upon axles, and it is recommended that the owner be only charged for the replacing of brakeshoes which have become worn beyond the limit specified in the rules.

In conclusion, your committee offers the following resolution:

Resolved, That the Master Car Builders' Code of Rules of Interchange be amended by the addition, as an Appendix, of the following rule:

SECTION 1. In delivering freight cars equipped with air brakes at interchange points the air-brake apparatus must be in good working order, and any car may be rejected by the receiving road if the air-brake apparatus upon it is defective in any respect. To determine whether the air-brake apparatus is in good order its operation must be tested under the full working air pressure of 70 pounds per square inch, at the delivery point, by the delivering road, and under the supervision of, or to the satisfaction of, the inspector of the receiving road.

The conditions constituting good order shall be as follows:

(1) The cylinder must have been cleaned and the triple

valve cleaned and oiled within six months, and the date of the last cleaning and oiling marked upon the brake cylinder.

(2) The cylinder must have been oiled within three months, and the date of the last oiling be marked upon the cylinder.

(3) The brake shoeslack must be so adjusted that under the full application of the brake the piston travels not less than four nor more than eight inches.

(4) The brake must apply and release promptly with proper handling by the engineer's valve.

(5) The triple valve and auxiliary reservoir must be free from water.

(6) The air pipes and all connections thereto must be free from leaks, and the pipes properly secured to the car body so that injury shall not occur to the apparatus car body nor leaks be produced by shaking and vibration of the pipe.

(7) The air-brake hose, when not coupled with that of another car, must be properly secured in the dummy coupling.

(8) The brakeshoes must all be at least three-eighths inch thick at the center.

(9) All parts of the brake rigging must be sound and efficient, and, in accordance with Rule 3, Section S, of the Master Car Builders' Code.

SECTION 2. A car having a defect in the brake apparatus may be received with a defect card for the same, provided that the defect be of such a nature that it shall not interfere with the operation of the hand brake upon that car, nor with the operation of the air brake upon any other car of the train.

April 16, 1891.

JOHN S. LENTZ,
WM. TURREFF,
N. W. SAMPLE,
Committee.

Mr. Lentz read a letter from Mr. E. B. Wall recommending that the brake gear pins be changed from $1\frac{7}{64}$ inches to $1\frac{3}{32}$ inches diameter. Practical experience with these pins had shown that $\frac{1}{64}$ inch between the size of the hole and the pin made too tight a fit. A motion was made to send the recommendations of this committee to letter ballot, but Mr. Rhodes directed attention to a number of defects of the proposed rules. After some slight discussion it was agreed to receive the report and incorporate it in the report of the proceedings, also that a committee make the necessary corrections to the rules and report at next convention.

Next subject introduced was the reading of the Executive Committee's report on

MAINTENANCE OF THE STANDARDS OF THE ASSOCIATION FOR COUPLERS OF THE M. C. B. TYPE.

At the last convention, held at Old Point Comfort, in June, 1890, the following motion prevailed:

"That the Executive Committee ascertain whether the M. C. B. type of coupler, now being furnished by the various manufacturers, conforms to the standards of the Association; that they submit a plan for the guidance of the Association in the maintenance of those standards, and that the Executive Committee be empowered to issue gauges, templets or special instructions for maintaining these standards prior to the next convention if they find it advisable to do so."

In pursuance of these instructions the Executive Committee appointed a sub-committee from among its membership, consisting of Messrs. Chamberlain, Barr and Grieves, to take up the details and ascertain whether the couplers now

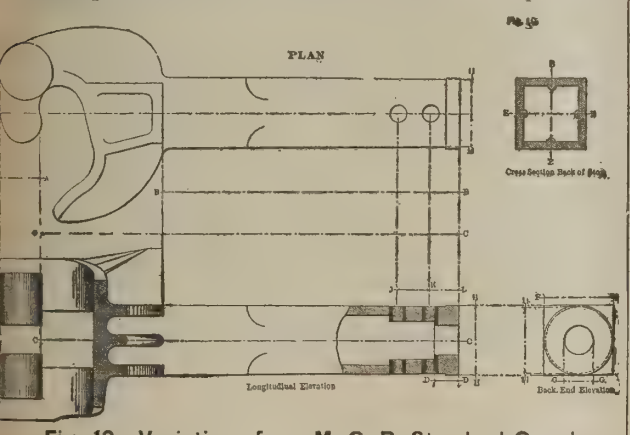


Fig. 19.—Variations from M. C. B. Standard Coupler.

being furnished by the various manufacturers conform to the standards of the Association, and to propose a plan for the guidance of the Association in the maintenance of these standards. This sub-committee performed its duties and reported to the Executive Committee on May 7, 1891, after having made reports of progress at each meeting of the Executive Committee held prior to that date.

The Executive Committee submits below the report of its sub-committee, as the report of the Executive Committee, as follows:

To the Executive Committee of the M. C. B. Association:

Your special committee appointed to ascertain whether the M. C. B. type of coupler, now being furnished by the several manufacturers, conforms to the standard of the Association, and to submit a plan for the guidance of the Association in the maintenance of these standards, would respectfully submit the following report and drawings:

* * * * * * * *

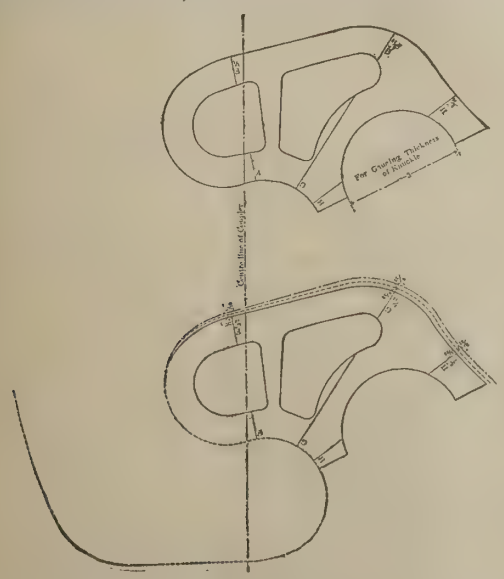


Fig. 20.—Proposed Contour Gauge for M. C. B. Coupler.

The results of examination of couplers submitted are set ofrth in cuts herewith, in which Figs. 1 to 18 show the contour lines of the various couplers submitted, as determined by casts taken from the samples sent to this committee. In these cuts the standard contour lines as prescribed in the annual report of the M. C. B. Association of 1890 are shown in dotted lines.

Fig. 19 shows all other measurements taken from the couplers submitted, in tabulated form as illustrated, in which tabulated form the standard measurements as prescribed by the Association are given for comparison.

For obvious reasons your committee would recommend that a maximum and minimum limit be established for the several parts of rough coupler castings.

The production of templets and gauges combining simplicity and efficiency for the determination and maintenance of standards has been somewhat perplexing, and your committee may not have devised the best forms of gauges, but they illustrate the points which need to be gauged, and it submits the gauges as shown and applied in Figs. 20 and 21.

Figure 20 shows minimum gauge or templet, for contour lines of coupler, and at designated points on gauge the variations in figures, to be allowed from this minimum gauge for maximum measurements.

Figure 20 shows also, in full lines, the proposed gauge in place; in dotted lines, the M. C. B. standard contour; in broken lines, the maximum variation to be allowed.

Figure 21 shows gauge to determine all other measurements of M. C. B. standard coupler as applied.

Respectfully submitted,
E. CHAMBERLAIN,
E. W. GRIEVES,
J. N. BARR,
Sub-Commitee.

The Executive Committee did not find it expedient to issue any gauges or templets prior to this Convention, but it would recommend that the gauges mentioned and illustrated be used by the members of the Association to ascertain whether couplers furnished them are near enough to the standard or not, and that proper limits of variation be adopted as the standard limits of the Association.

JOHN KIRBY, E. D. CASANAVE,
T. A. BISSELL, W. H. DAY,
E. CHAMBERLAIN, JOHN S. LENTZ,
J. N. BARR, R. C. BLACKALL,
E. W. GRIEVES, J. W. MARDEN,
G. W. DEMAREST,
Executive Committee.

A discussion followed regarding gauges and templets, and finally a motion was carried that the Executive Committee be instructed to make necessary arrangements to issue templets in accordance with the recommendations of this committee for the use of manufacturers of M. C. B. couplers and the railroad companies as needed.

The report was next read of the Executive Committee on

JOURNAL BOX, BEARING, WEDGE AND LID FOR 60,000-LB. CARS.

To the President and Members Master Car Builders' Association:

The Executive Committee considers it important that the Association should adopt a standard form of journal box, with bearing, wedge and lid, for 60,000-lb. cars, adapted to suit the standard axle for cars of this capacity already adopted by the Association.

The committee which reported in 1890 on journal box, bearing and lid for 60,000-lb. cars and lid for old standard journal box made a very careful report with drawings, which showed the Fletcher type of lid hinged at the top, as the Fletcher lid had previously been adopted as a standard form of lid by the Association, but nothing had been decided as to its detail measurement, nor as to its method of attachment to the journal box. The convention of 1890 ordered the drawings changed to show the lid pivoted at one side of the box instead of at the top, and submitted to letter-ballot vote. Upon submission of this question to a letter-ballot vote there were 548 votes cast, of which 299 were in favor of the adoption of the modified plan as standard and 249 were opposed to its adoption, and as two-thirds of the votes cast are required for the adoption of a standard the measure was defeated.

The Executive Committee believes that the failure to adopt the proposed standards was due to a difference of opinion in regard to the lid, and inasmuch as a lid of the Fletcher type, hinged at the top of the box, was defeated in the convention last year, and a regular Fletcher lid, hinged at one side, was defeated by letter-ballot vote since that convention, this committee recommends that the Association should rescind its former action adopting the Fletcher type of lid as a standard, and that the journal box, bearing, wedge and lid for 60,000-pound cars, as shown in cuts herewith, should be submitted for adoption as standard by letter-ballot vote, with the provision that the lid may be made either of malleable iron or pressed steel. These cuts are identical with those submitted by the committee last year, with the exception of the lid and the changes necessary at outer end of box in changing the style of lid.

With these explanations and the above recommendation the Executive Committee leaves the matter in the hands of the Association for such action as it may think proper, and submits below the report of last year's committee.

Respectfully submitted,

JOHN KIRBY, E. W. GRIEVES, JOHN S. LENTZ,
T. A. BISSELL, G. W. DEMAREST, R. C. BLACKALL,
E. CHAMBERLAIN, F. D. CASANAVE, J. W. MARDEN,
J. N. BARR, W. H. DAY,
Executive Committee.

"The committee respectfully submits for your consideration and adoption the designs herewith of a proposed journal box, bearing and lid for 60,000-lb. cars, in which the Fletcher lid may be either of malleable iron or pressed steel, as shown. The committee finds it advisable to make a larger journal box than the present standard, and it recommends the change shown in the wedge and brass for the new journal box, because this construction gives a full bearing of the wedge upon the brass, and is less liable to deform the brass when it becomes worn thin than in the old practice of concentrating the load upon the middle of the brass. The necessary clearance for rocking motion is provided between the wedge and the top of the journal box, instead of between the wedge and the brass, and the wedge must be of such strength as will serve to distribute the load evenly over the whole length of its bearing upon the back of the brass. This enlarged journal box has the opening for the lid maintained at such dimensions as would permit the use of the same lid on the new and the old boxes by a slight modification in the opening of the present standard journal box.

"The committee therefore submits also a design showing the same lid, whether made of malleable iron or pressed steel, adapted to the present standard journal box, and recommends its adoption as standard for that box. No changes are made in this standard journal box except in the opening, which has heretofore been incomplete on account of no means being shown for attachment of lid, and which the committee proposes to complete in such manner as will permit the use of the same lid as herein proposed for the new standard journal box for 60,000-lb. cars."

JOHN S. LENTZ,
F. D. CASANAVE,
R. MCKENNA,
J. N. LAUDER,
A. A. JACKSON,
Committee.

Mr. Lentz submitted a blue print showing the modifications necessary in the old standard journal box to adapt it to the new form of lid. This was submitted to letter ballot.

After some other routine business the convention adjourned.

WHEEL GUARANTEE.

Your committee appointed to consider the report of the meeting of the Association of Manufacturers of Chilled Car Wheels held Nov. 21, 1889, at New York City, reports as follows:

The only material point of discrepancy between what appears to be the desire of the wheel manufacturers and the provisions of the specifications for cast-iron car wheels adopted by the Master Car Builders' Association, is given in the second article of their resolutions, which reads as follows:

"That when wheels are taken out of service on account of sharp flanges, flat spots, comby or shelled-out treads, or for cracked brackets or plates, and it is found on breaking up the wheels that the depth and character of the chill and the strength and character of the metal in the plates are up to the standard specifications adopted by the Joint Conference Committee of the American Railway Master Mechanics' the Master Car Builders' and the Wheel Makers' Associations, it shall be considered that the failure is due to the service and not to the quality of the wheel, and that the wheelmaker ought not to be called upon in such cases to pay for or replace any such wheels."

It will be seen from this that all wheels with sharp flanges, flat spots, comby or shelled-out treads, or with cracked brackets or plates, shall be broken, and, if they meet the specifications as to breakage and character of metal called for by the Master Car Builders' specifications, the wheelmakers shall not then be held responsible for the replacement of such wheels.

This proviso is in the first place indefinite, and in the second place would virtually put the wheelmakers in a position that they could under its provisions refuse to replace any wheels.

I. As to sharp flanges: A careful observation of this phenomena shows that in ninety-nine cases out of a hundred one wheel has a sharp flange, while its mate wheel on the same axle has a flange which is almost as good as on the day it was placed in service, showing that there has been a tendency in the pair of wheels mentioned for the wheel with the sharp flange to run all the time against the rail. The causes of this tendency are as follows:

1. Wheels may vary in size on the same axle.
2. The trucks may be out of square.
3. One wheel may wear faster than the other, the fastest-wearing wheel always running to the flange.

1. In our opinion mismating at the present day is a very rare occurrence.

2. As to the trucks being out of square, our observations would imply that this cause is not active in producing worn flanges, and, if it were, one of the principal reasons for believing this is that in this case the worn flange on one pair of wheels would certainly produce a worn flange on the other pair of wheels in the same truck, and we feel safe in saying that we do not find this correspondence, one pair of wheels very often having a very badly worn flange, while the other pair of wheels in the same truck shows no perceptible wear on the flange.

3. In our opinion the third cause, that is, the difference in the wearing qualities of the two wheels on the same axle, is the cause of nearly all flange wear, and for this cause the wheelmakers should certainly be held responsible. To sum up the matter of sharp flanges, if mismating can be shown, or if the wheels are not pressed on to an equal distance from the journal, the wheelmaker should not be held responsible for worn flanges, but that for all other causes of worn flanges the wheelmaker is in all justice responsible.

II. As to flat spots, we presume that the term "flat spots" does not include flat from sliding, as there is no question on that point, but that by the term "flat spots" is meant wheels having spots on them which have been worn through the chill or white iron. We cannot understand how under any circumstances the wheelmaker should ask to be relieved from responsibility from this defect, and we cannot see either how an inspection of the wheel by breakage should relieve him of responsibility, because an inspection would show that on this spot the proper depth of white iron did not exist as called for in the specifications. If such a proper depth of white iron existed, the wheel would not wear flat.

III. As to comby or shelled-out treads, these defects are entirely due to the quality of the wheel and are not caused under any circumstances by improper treatment of the railroads, and it seems to us that there can be no question as to the responsibility of the wheelmakers for such defects.

IV. As to cracked brackets or plates, these defects are caused either by brittleness in the iron or by improper design of the pattern. Railroads expect to buy wheels which are properly designed and are made of material which will not crack in the plates or in the brackets, and the percentage of such failures in good wheels demonstrates to every railroad man that wheels can be made practically free from such defects, and should be so made, and any encouragement to wheelmakers to run the risk of making wheels with such defects would be very detrimental to the railroad interests. It is true that on railroads with very heavy grades the failures from cracked brackets or cracks in the hollow where the single and double plates unite are very serious, but with good wheels it is safe to say that for every one wheel that fails in this way twenty pass the ordeal successfully and fail from finally wearing out, and we do not feel that we could recommend that railroad companies should recede in any way from their rigid requirements in this respect.

The wheelmakers, by the terms of the specifications, are formally relieved from responsibility for flat by sliding, chipped flange, broken flange, if such defect is not caused by seams worn through chill or worn flange, broken or chipped rim, not caused by rim being hollow, and breakages of any kind caused by wreck or derailment; they now ask practically to be relieved from sharp flanges, flat spots, comby or shelled-out treads, and cracked brackets and plates.

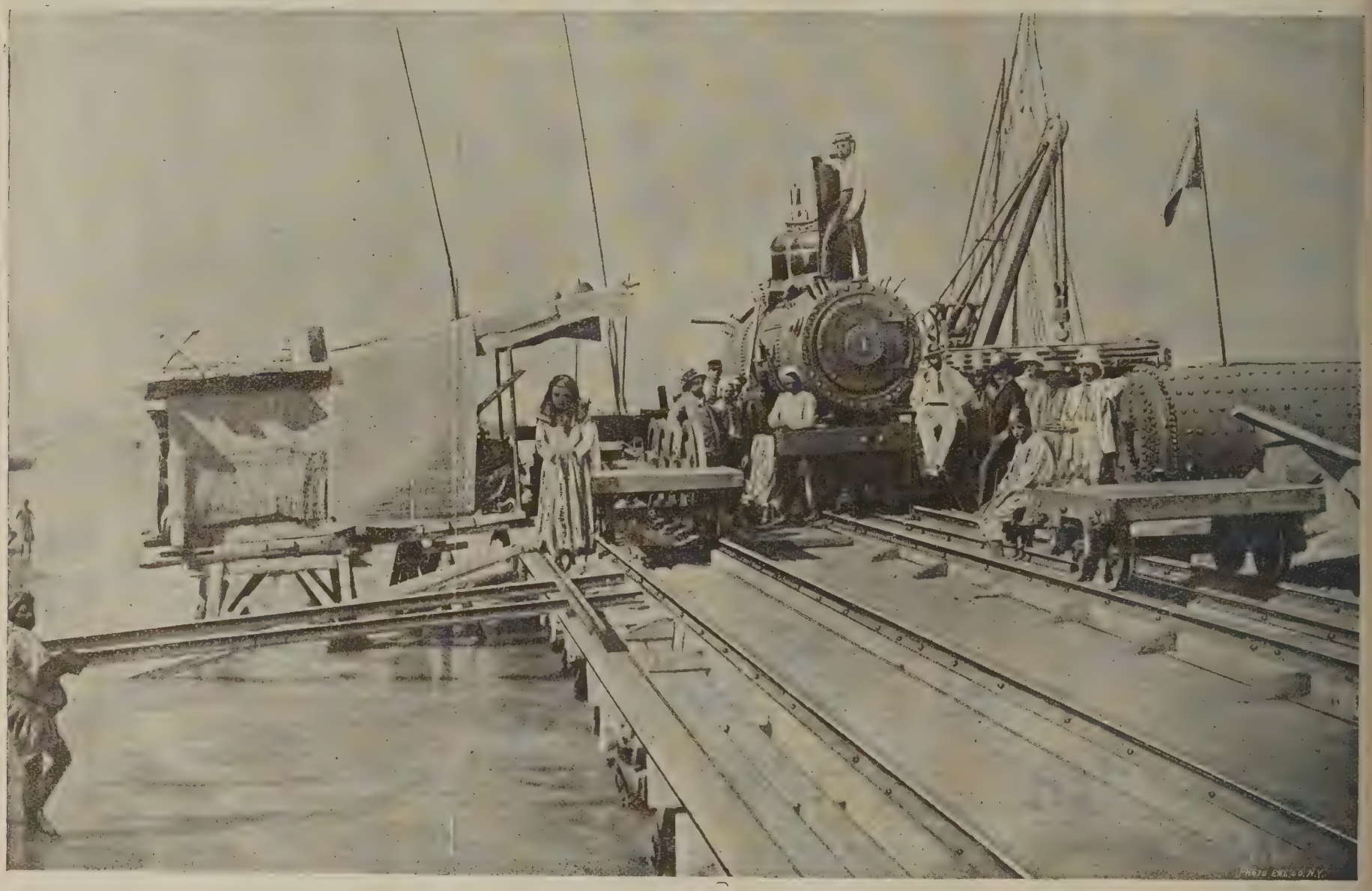
As far as our knowledge goes, there is only one other defect from which they can ask to be relieved, and that is seams in the tread, a defect of remarkably rare occurrence. It might possibly be fair to divide with wheelmakers in the matter of sharp flanges, holding them responsible for one-half, the railroad being responsible for the other half, for wheels failing in this way; but it is our opinion that this really would be a more liberal allowance than justice could demand.

Committee: J. J. HENNESSEY, THOMAS SUTHERLAND.

Journals lately received from Australia indicate that things do not run very smoothly in the management of railroads by government and politicians. For seven or eight years the railroads of Victoria have been managed by a Board of Commissioners appointed by the home government, and therefore independent of the people of the colony. The people allege that the rule of these commissioners has been autocratic, extravagant, and influenced by considerations that favor all old-country interests in preference to the interests of the colony. A bill has now been introduced into the Victoria Parliament with provisions that will take away the power of the Railroad Commissioners and give it to the Minister for Railroads.

Landing a Locomotive in Palestine.

The scene shown in the engraving is reproduced from a photographic view taken of the landing and setting up of the first locomotive at Jaffa for the Jaffa & Jerusalem Railway. The engine was a light mogul, one of three built by the Baldwin Locomotive Works, Philadelphia, and taken out and put to work by Mr. Crawford, one of the agents for the firm. In the picture he is seen standing on the smoke box. The men about the engine are mostly European engineers and others connected with the construction of the railway, but there are a few native idlers attracted by curiosity, and the individual in the foreground who looks like a woman is an old Syrian patriarch whose contempt for western barbarians was not so strong as his curiosity to witness the strange things they were landing on the Holy Land.



LANDING A LOCOMOTIVE IN PALESTINE.

To get the locomotives on to the line they had to build a trestle railroad on the beach partly round the town, under massive walls that were built in the childhood of civilization. The Philadelphia locomotives were landed at one of the oldest towns in the world, destined to run into a city that is of interest to more christians than any other place on earth.

Jaffa, or Joppa as it is called in the Greek of the New Testament, is situated on the sea coast of Syria, about 33 miles northwest of Jerusalem. The place is said to be one of the oldest towns in the world. This is where, according to classic lore, Andromeda was chained to the rock and exposed to the sea monster. This was the port of Jerusalem during the time of David and Solomon, and it was to this place that the cedars of Lebanon were floated from Tyre for the building of Solomon's Temple. In some of the ancient moss-covered buildings under which the railroad was built dwelt Simon, a tanner, whose house was by the seaside, at whose house the Apostle Peter received new light on his duties to mankind. The beginning of a greater light may have gone to Syria in the steel and iron machines from America, which passed, with flags flying, under the hoary walls, and is now ready to help in dissipating the clouds of moral and mental darkness of which the locomotive and its following are sworn foes.

Curiosities of Timber Nomenclature.

It is no wonder that lumbermen have such a bewildering confusion of names of the various kinds of trees used for lumber. If the trees were correctly named at the start by old father Adam they have been so changed since by climatic influences, by hybridization, development or natural selection that it is extremely doubtful if he would recognize them now if he were hired to exploit a timber claim. It is certain that his descendants at the present day don't know them all by the same names. Even the botanists have still further mystified the matter by arranging them as "class," "order or family," "genus" and "species," according to nice scientific distinctions that are entirely useless to a practical lumberman. There is hardly a lumberman in the world who would call a cabbage a horseradish or a pear tree a rose, and yet, according to botanists, the two former belong to the mustard family and the two latter to the rose family, as well, also, as does the wild black cherry, so dear to the lumber trade. According to this scientific classification the red cedar of the limestone glades of Tennessee and the white cedar of the swampy northwest both belong to the pine family; but the first is a juniper and the latter a cypress, and both are first cousins to the yew tree. The Douglas fir belongs to the same family, but according to Linnæus it is a spruce, and close kin to the big she balsam of eastern Tennessee and western North Carolina. Yellow poplar of commerce called whitewood, north of Mason-Dixon, belongs to the magnolia family, but it is a tulip tree, and the only variety of its genus, and has but few near relatives in America.

The true poplar (*populus heterophilla*) belongs to the willow family, but when it is sawed into lumber it is cottonwood, and there are seven varieties in North America. And then there is the sweet gum, considered by the gum-chewing youth of the South as the sweetest and loveliest tree in the woods, and looked upon with suspicion and contempt by the average lumberman; it belongs to the witch-hazel family and is the only variety of its genus. It has no relatives and but few friends in America. It is no kin to the black, sour tupelo and all that disreputable class that masquerade under the common name of gum to keep the public ignorant of the fact that they really belong to the dogwood family.

Among the oldest and most respectable of trees is the oak family, and it is a pretty large family, there being no less than 37 varieties exhibited in the Jessup collection of woods in the American Museum of Natural History. In the collection are six varieties of white oak, two of red, one of scarlet, and several of black and other colors.

In the lumber trade they are all put into two classes—white and red. They are all respectable members of the great family of woods, and so are their relatives, the chestnut and birch, and all stand deservedly high in public estimation.

The comparison of the common and local names of the various American commercial woods and utter disregard of their botanical classifications has wrought a great injury to the financial standing of very many meritorious woods. Long years ago one part of the country wanted white wood, while another part was looking in vain for a market for untold millions of feet of yellow poplar, and they never found out it was one and the same wood under different local names till the lumber trade papers were established and told them. Even now a bale of Michigan white cedar shingles could not possibly be sold in the red cedar belt of Tennessee unless they were called cypress. A noble wood—*liquidambar styraciflua*—the only tree in America belonging to the *hammamaceæ*, or witch-hazel family, had the misfortune to be saddled with the low, plebeian name of "red gum," and has met with so much obloquy and reproach in its native land that when it travels in foreign countries it is forced to call itself "satin walnut" in order to gain admittance into respectable company.

Such gross injustice ought not to be repeated. There is a member of the magnolia family numerously inhabiting the Allegheny and Cumberland mountains, closely resembling its first cousin, yellow poplar, but having a fine, satiny finish and superior to it in some respects, that has not yet made its début in lumber circles. Its tony, scientific name is *Magnolia accuminata*, but its common name is cucumber, and the natives pronounce it "cowcumber." Great Scott! If it goes into respectable lumber circles under that horrible name it is damned previous to delivery and without hope of redemption. It is already limited in its usefulness to the single degrading purpose of making pump stock. If we must nickname it, let us call it "satin poplar" and allow it to take its position among the aristocratic finishing woods.—Dan W. Baird, in *Northwestern Lumberman.*

The Illinois Central people have been contemplating for some time the building of new repair shops at or near Chicago, which are badly needed, but the uncertainty about the company's legal rights to lands on the lake front has caused the improvement to be postponed from time to time. In view of the great increase of power that will be required to perform the company's business during the World's Fair, something has to be done at once to increase the shop facilities, and they are about to erect roundhouses at 25th Street and 67th Street. The present roundhouse will be used for a boiler shop and more room provided for the machine shop. It is a makeshift arrangement that is likely to give little satisfaction.

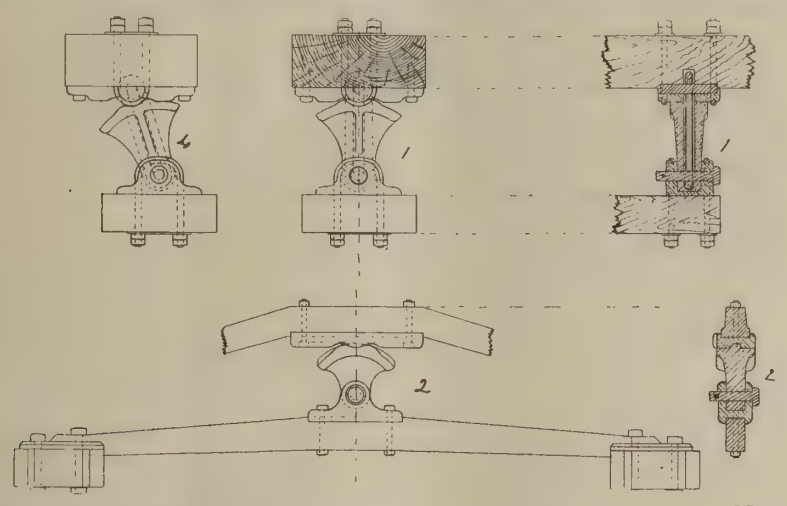
The question of passes on railroads is agitating the Australian public at present as much as it has excited the American public at divers times. The railroads in most of the Australian colonies are operated under government control, and every man, woman and child with a government connection appears to consider themselves entitled to free transportation. No less than 400 Members of Parliament hold annual passes, and favored politicians are able to secure perpetual free passes. Those who do not enjoy the privilege of riding free are beginning to protest against the pass system, and the tone of the press indicates that those who demand a change mean business. An editorial in one of the leading journals thus concludes a vigorous attack on the giving of a perpetual pass to a politician: Our railways do not pay; they have been so recklessly constructed, so sadly mismanaged, that selectors who have hoped for lines for years must hope on, that a general reduction of the facilities afforded to travelers and to those forwarding goods must be accepted as inevitable. Men know that despite this free passes have been showered right and left, and they are not likely to think very kindly of politicians who accept perpetual free rides for standing at the door of the Cabinet idle as the Peri at the gate of Paradise.

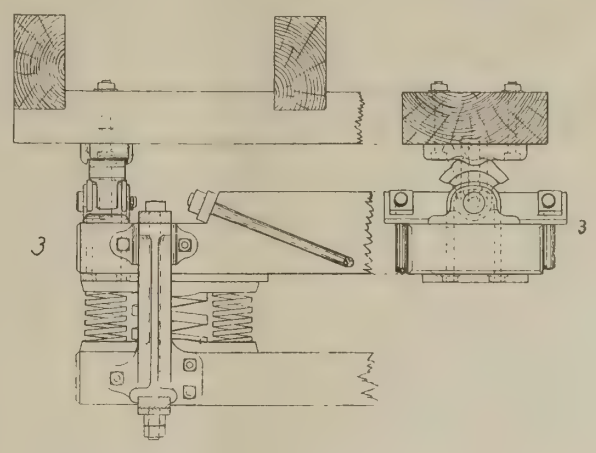
Flange Wear and Its Prevention.

Next to the wheel itself, the most prolific or original cause of flange wear is the want of ease in curving of the truck, which is a fact lost sight of by too many car builders.

There are quite a number of devices in the field for the prevention of friction in curving, but there are very few of them but what in time lose the power they originally possessed.

A hard side bearing will cause trucks to become out of square, which, in time, will cause flange wear. Admitting that there are types of trucks that are rigid, *i. e.*, cannot be moved out of square without breaking something, then, of course, the cause of flange wear is not so great, and can





only be attributed to hard side bearings, or, as first stated, the wheel itself, which is not now under discussion. In side bearings, which is one of the most essential features of car constructions, very little advance has been made in the way of improvement. With a few exceptions, the same principles in centre and side bearings of 30 years ago are in use to-day.

Car builders are about equally divided on the following two plans: (1) Wide flat centre plates with all centre bearing and from ⅛ to 1 inch space between the top and bottom side bearings; (2) A smaller centre plate, either flat or concave, and top and bottom side bearings close, with probably equally as much weight on sides as in the centre. The former would be the easiest on flange wear, provided the bearing could be kept on the centre under all loads and conditions, which is next to impossible, especially when wooden body bolsters are used. The side bearings will come together under a load and the result is, the body bolster assumes the shape of an arc. The latter plan, with an equal side and centre bearing, at least has honesty in it; the body of the car is not strained out of shape trying to maintain a center bearing.

Several plans on the roller principle have been tried, but have not been successful enough to be very generally adopted, The frictionless roller bearings, that have lately come into the market, are but a revival of a plan of twenty years ago, which proved a failure, because the rollers would become choked up with dirt and wear flat. The continual pressure on one spot on the top plate would wear it hollow, which would confine the free curving of the trucks to a very limited space. The writer has had some experience with a rocker side bearing combined with a safety or check link to keep truck in line with car in case of derailment, which has proved very successful, especially in passenger service.

The principle is shown in the attached cuts. No. 1 represents the rocker principle, with link attachment, as applied to an outside bearing four-wheel passenger truck. No. 2, the rocker bearing (without link), as applied to side bearing of a six-wheel passenger truck. No. 3, as applied to a well-known type of rigid freight truck. The safety link should be used on trucks with bearings outside the center line of journals or more than 6 feet 3 inches between centers of side bearings, less than that the strain is too great on safety links when off the track. On the principle that the longer the lever between the power and the fulcrum and the shorter between the fulcrum and load the less power is required to lift the load, it is not advisable to use the safety link on inside bearing trucks with the rocker bearings.

Cut No. 4 shows the position of the rocker bearing when car is on a curve. The same distance is maintained between top and bottom at any point of curvature. The truck will recover its natural position in line with the body with as much ease as it reached the curve or angle with the body. Another important feature is the more weight there is on the rocker side bearings and the less on the centre, the easier the trucks will curve, because the resistance on the center is reduced in greater proportion to the reduction of weight on the centre, than the resistance is increased on the side or rocker bearings by the increased weight, which is the principal claim made for the rocker side bearings. In this principle we have undoubtedly overcome the principal cause of sharp flanges that may be attributed to mechanical construction.

More than this, less power is required to move a train around curves. If the advocates of rigid trucks would favor a reform in the principle of side and center bearings, they would surely gain many points in their favor. One of the principal advantages that the swing motion truck has over the rigid truck is its flexibility going around curves; there can be no question but what the rigid truck with improved bearings would be equal to the swing motion in respect to ease of movement.

The rocker side bearings can be used with or without the check or safety link. It has been demonstrated to be very effective in keeping truck in line with track when derailed. It also is a close connection between truck and body in case of derailment, and the body of car is at an angle that would cause it to turn over if not connected in this way. No doubt there are occasions when it would be an advantage not to have the body and trucks connected, but such cases are very few in proportion to those where such a connection would prevent the body from rolling down a bank.

With the fact staring us in the face that the principal cause of flange wear is traceable to, (1) trucks becoming out of square when moving around a curve and remaining in that condition until a reverse curve is reached, (2) hard side and center bearings, is it not time that some move was made toward improvement in these two important features of car construction? J. D. Mc.

Progress of Compounding.

BY HARRIS TABOR.

Since the time of Woolf the plan of expanding steam through two or more cylinders has been the subject of controversy between engineers. Unfortunately, the earlier advocates of this plan met conditions unfavorable, and it was not until the higher steam pressure of more modern engineering was adopted that this method was really put on its merits. When tested with the pressures carried twenty years ago its advocates had a sorry time, but with the better practice in boiler construction, and the demand for larger and more economical steam plants, multiple expansion has made rapid progress, and to-day we find it so generally adopted in the marine service that it may be said to have no opponents. Increased steam pressure has so much influence in the economy of compounding that it may be an equal factor with multiple cylinders, and this fact must not be ignored in the discussion. No man would dare compound, with a view to getting economy, if only 40 pounds pressure were to be used, for the reason that contact with the extra metal in the added cylinder would condense more steam than the reduction in the temperature limits by compounding would save. The experience of the early designers of the compound engine have given conclusive proof of this.

In considering the success of multiple cylinder in stationary and marine practice, we must admit that increased expansion has followed an increase in boiler pressure, and the two have given most gratifying results. It is no exaggeration to say that the boiler pressure has been raised 100 pounds in steamship practice within the last few years; there has not been a corresponding gain on land, but pressures to-day are much greater in stationary practice than ever before.

The advances in this direction on the part of marine and stationary engine builders have given the compound engine a healthy impetus in the railroad direction. The English and continental builders have done more, perhaps, in the way of numbers, in compounding, but if one may judge from reports, it is doubtful if they are so far advanced in efficiency.

We look to the American railroads for decided advances in motive power through the adoption of the compound system, but we must admit that they cannot control all the conditions tending to help in this direction, and, in consequence, their progress must be slower than that of their predecessors. They can never hope to utilize pressure below atmosphere with the aid of condensers, but they start with a steam pressure so high that the gain from a condenser is reduced to a minimum. The present method of using the exhaust steam to force the draft must interfere with best economy, just in the proportion that it interrupts expansion, and here a gain may be made that will be decisive, for in compounding there will be less drain made on the boiler and smaller demand for the strong draft now necessary, and the back pressure may be decreased.

The limitation to 10 feet of roadway may confine the designer to a ratio of cylinders not to his liking, where great power is called for, and here he may find himself cut off from a portion of the saving he would make if no restriction existed.

The tandem system might give him relief, so far as room is concerned, but it is doubtful if he would care to expose so much cylinder surface to air currents of 50 or 60 miles per hour.

The locomotive cannot be considered from the standpoint of the marine or stationary engine. In one case, nothing stands in the way of the designer. He may tear down old practice and build up new to his heart's content without meeting cast-iron conditions. The only question is: Will it pay? But with the locomotive it is different. Roadway, running conditions, forced draft and a dozen established customs that cannot be changed keep the design within certain limits, which must be considered from the locomotive builder's view. These objections may be overcome in time, but it cannot be done by revolution. The wonderful efficiency of the locomotive of to-day is the result of years of study and improvement, and radical changes cannot be made without again going through a long running experience. Every attempt at revolutionary practice has proven this.

The advocates of the compound in railroad practice claim too much and its opponents too little. We occasionally hear of tests showing great efficiency, but we do not get enough data to feel warranted in accepting all the results claimed.

A comparative test should be made with the engines under the same conditions of steam pressure, load and ratio of expansion. It is difficult to do this, because the cylinders on the simple engine are too small, but until this is done no man can tell how much gain the compound will give him. It is unfair to the simple engine to expect as good duty from it with two expansions as may be obtained from the compound expanding the steam five or six times, yet this is really the basis of most of the tests submitted.

The tests of the Westinghouse Machine Company, which, by the way, contain more information on tests of compound engines than any we are familiar with, show that the best duty, non-condensing, was obtained cutting off later than half stroke in both cylinders, with steam at 100 pounds pressure. If the clearance be taken into consideration the cut-off would be still later. The cylinder ratio was about 3 to 1. This proves that economy from non-condensing compound does not depend so much on liberal expansion as on the reduction of extreme temperatures in the cylinder. It also proves that the limit of expansion is soon reached, running non-condensing, in the compound. It is also conclusive proof that there is a decided gain in expanding through two cylinders, but we must accept that gain without exaggerating it. If this is done it will probably be much nearer 15 per cent. than 50 per cent., as claimed by many.

Undoubtedly there are tests on record where the gain of the compound locomotive has been fully 50 per cent. greater than the simple, but the conditions were dissimilar. The conditions cannot be exactly alike; no man would attempt to carry expansion as far in one cylinder as in two, but he can make the cylinders on the simple engine large enough to give it some chance in competition, and if he will do this he will be surprised to see how much real merit there is left in the old standard of so many years.

The difficulty in using large cylinders for liberal expansion has come from the traffic officials, who insist upon loading the engine to its maximum capacity. If, when the cylinders are increased, the latest cut-off is fixed at half stroke, and sufficient power given to slip the wheels, such an engine, running with wide-open throttle and under the same boiler pressure as the compound, would make a very interesting rival. It is doubtful if any builder of compound locomotives would care to guarantee a greater saving than 15 per cent. At any rate, he would not care to do it the second time.

All who are interested in steam motors of any description are watching the railroad people with more than ordinary interest.

The high pressures used in connection with compounding takes the subject beyond the practice of the stationary builders; hence the interest shown by all engineers.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

A CHALLENGE.

The *Railroad Gazette* has for some weeks been publishing a notice saying: "The *Railroad Gazette* has more railroad officials as subscribers and readers than all other railroad papers combined." This is a piece of insolent audacity, done in an attempt to bolster up a waning reputation at the expense of others. We are only one of nine or ten railroad papers, but we are prepared to show by an examination of our mailing list that we have more subscribers among railroad officials than the *Railroad Gazette.* We are ready to submit our subscription list to a comparison with that of the *Gazette* by a committee of business men as soon as our contemporary agrees to have them appointed.

THE MASTER CAR BUILDERS' CONVENTION.

The reports read before the twenty-fifth convention of the Master Car Builders' Association were not so interesting or so important as those submitted at some of the previous meetings, but they were sufficiently good to be above the average, and several of them contained suggestions and recommendations that would be of great value to railroad companies if they were followed. The reading of several good reports does not make an interesting or profitable convention, and we are constrained to confess that the meeting at Cap May compared unfavorably in interest and value with several previous ones where the questions at issue were of less importance. A report of a committee nearly always represents the beliefs, impressions and conclusions of a narrow circle, very often those of one or two of the committee, and sometimes its greatest value is in drawing out information from the members generally in discussion. The most valuable reports read at last convention were passed without discussion because there was not time to take them up thoroughly. The want of time for this important business was due entirely to the hours wasted in discussing trifles that were not entitled to a minute's consideration.

The greater portion of the superintendents of motive power who attend the Master Car Builders' Convention go there for the purpose of taking a part in the discussion of the rules of interchange of cars; but it is badly magnifying the importance of this part of the convention's business to devote the greater part of two days to it, as was done at Cape May. The new plan of having the proposed changes in the rules of interchange of cars discussed at the railroad clubs, and then submitted with recommendations by the Arbitration Committee, promised last year to greatly reduce the labor of settling the changes at the convention, but the arrangement did little good this year. If the recommendations of the Arbitration Committee had been accepted the business of settling the changes in the rules would have been complete in two hours and the rules would have been substantially what they were when they emerged from the word conflict of two days' duration. The people in some States of the Union have come to regard with relief the day when the legislature closes, for it puts an end for the time being to the useless tinkering with law making. If those who are entitled to take part in the discussion of the rules of interchange of cars persist much longer in squabbling over useless changes, they will force their constituents to the conclusion that a suspension of the interference with the rules would be a decided advantage to railroad companies.

A decided move in the right direction was made when the convention adopted the report of the Conference Committee appointed last year to devise means of bringing the two conventions closer together and for arranging to hold them at the same place. As the Master Mechanics' Association adopted the report of their committee, the matter is definitely settled. Under the new rule the next Master Car Builders' convention will meet on the second Wednesday of June and the Master Mechanics' convention on the Monday following. The place of meeting will be agreed upon by a joint committee composed of five officers of each association.

When the report on "Steel Plate and Malleable Iron in Car Construction" was under discussion, a motion was made to refer the recommendations to letter ballot, and opposition was raised to this course on the grounds that the drawings were not sufficiently plain to indicate with exactness what was to be voted on. The point was also made that recommendations in reports ought to be thoroughly considered before they are sent to letter ballot. This is a matter which ought to receive much greater attention. There is too much tendency to propose for standards of the associations forms and parts that are not deserving of being so distinguished. The recommending of articles as standard seems to be the aim and object of some committees. When the recommendations are voted favorably on in the convention, many of those entitled to vote on letter ballot will give the proposed standards their indorsement, and the consequence is that many standards are established merely to be ignored. What is badly wanted is a little more education of members respecting the articles that are proposed as standards. If the merits and shortcomings of every article recommended as standard were thoroughly discussed in the conventions, the practice of voting yes and then ignoring the standard would be less prevalent.

The numerous railroad men who interested themselves in the plans for joint car inspection that have been so thoroughly discussed in our columns during the last three years will be pleased to note that the convention has sent to letter ballot a plan of joint inspection. On an examination of the plan as detailed in the report to be found in another part of this paper, it will be seen that it is a modification of what are known as the Buffalo and the Detroit plans of joint inspection. An interesting discussion of the merits of the two plans will be found on page 77 of the NATIONAL CAR AND LOCOMOTIVE BUILDER of last year.

One of the most important and seasonable papers ever submitted to the association was the report of the Executive Committee on "The maintenance of the standards of the association for couplers of the M. C. B. type." It was hoped that when the M. C. B. type of coupler was adopted it would put an end to the confusion and inconvenience that have hitherto existed in repairing and inspecting foreign cars through the great variety of couplers in use. The change has threatened to make the confusion worse confounded and has introduced a new element of inconvenience through some of the couplers departing so far from the standard lines that there is danger of their not coupling with others or of uncoupling on the road. The danger of this condition of affairs soon became apparent, and a year ago a motion was carried instructing the Executive Committee to ascertain whether the M. C. B. type of coupler being furnished by various manufacturers conform to the standards of the association. The Executive Committee appointed a sub-committee to investigate the matter, and the work was done with decided vigor and ability. Drawings were submitted showing the contour lines of 18 vertical plane couplers with the standard contour lines beside them. Gauges were also submitted which would show readily the limit of deviation from the contour lines permissible. The convention instructed the Executive Committee to issue during the coming year gauges of the form presented, for the use of manufacturers and others. This will exert a satisfactory influence in keeping couplers to the standard contour lines.

The report on "Air-brake Standards and Inspection, and Care of Air Brakes on Freight Cars" was a particularly able production, and the recommendations made doubtless would have been sent to letter ballot had not Mr. G. W. Rhodes pointed out some defects which ought not to exist in a standard code of that important character.

THE MASTER MECHANICS' CONVENTION.

The twenty-fourth annual convention of the Railway Master Mechanics' Association, which met at Cape May on June 16, undertook to dispatch such an extended programme of business that we were afraid the tendency from the opening to the finish would be to get through the work hurriedly, and that nothing would be properly considered. In these disquieting anticipations we were happily disappointed. The convention set steadily to work on the morning of the first day and held tenaciously to business through three long sessions with the result that all matters of importance were deliberately considered and the leading questions brought before the meeting were thoroughly discussed. No small portion of the credit for this prompt dispatch of business was due to the able way in which President Mackenzie held the members to work and checked the inclination to indulge in trifling talk which frequently leads to so much waste of valuable time. It must be admitted, however, that the tendency in this direction was very slight, and that most of the members present gave the president hearty cooperation in carrying out the long programme.

A distinguishing feature of this convention was the number of members who took part in the discussions. This is a thing that ought to be encouraged. At most meetings of practical men, where the members have not gone through the training that enables a man to express himself fluently in a sustained argument, there is a tendency for the greater part of the speaking to be done by a few members. This has always been noticeable in the mechanical associations, and in even railroad clubs. Its effect is to narrow the field from which mechanical information and exchange of experience is to be obtained. Over forty-five members took part in the discussions at Cape May, which was 34 per cent. of the attendance, and nearly twice the proportion of those that spoke at the preceding convention.

Almost the first act of the Convention after the routine business was disposed of was the settling of a matter that will be a permanent monument to the Association. This was the converting of the Boston Fund into permanent scholarships in the Stevens Institute of Technology for the benefit of sons of members. The nucleus of the Boston Fund was raised at Boston when the Association met there in 1872. At that time it was considered proper to arrange elaborate entertainments for the members and their friends during convention times, and the people of Boston and others raised considerably more money for entertaining than what was required, and the surplus was given to the Association. The fund has greatly increased in the nineteen years of its existence. Various schemes have been suggested for the disposal of this fund, a favorite plan at one time having been the establisment of a testing laboratory. Others wished to devote the fund to the purchase of a place that could be used as permanent headquarters of the Association. The plan of devoting it to the purchase of scholarships originated with Jacob Johann, and it received the cordial support of J. H. Setchel, and J. N. Lander and other of the older members. At the convention a year ago Mr. Setchel secured the appointment of a committee to arrange for the disposal of the fund in scholarships, and at Cape May this committee reported in favor of giving the fund to the Stevens Institute of Technology, Hoboken, N. J., in exchange for four scholarships. The course in that institution lasts four years, and the trustees of the school have agreed to give one scholarshlp each year. Candidates for the scholarships are required to pass the preliminary examination of the institution, and if there are more than one candidate he who passes the best examination will obtain the scholarship. Candidates are required to take the mechanical-engineering course, and they must have one year of shop experience before entering. This latter requirement was put in at the suggestion of Mr. J. N. Barr, who is a technical-school graduate himself, and knows the weak point of the training.

There were some important changes made in the association as an organization. In the first place arrangements have been made to have it incorporated in the State of New York, which will give the association a legal existence. The increasing size of the association and the fact that it has to make a legal contract in disposing of the Boston Fund make this move imperative. The constitution has been changed so that associate members must stand over a year for election after their names are proposed. This is a very desirable amendment. Another change enables the builders of cars to be represented in the association, in the same way that locomotive builders always have been represented. There is no objection to mking the association as broad as possible, and we do not think it would be a bad plan to admit those who are eligible for membership in the American Railway Association.

The number of reports that had to be read shortened the time usually devoted at the noon hour each day to the discussion of topical subjects, but there were two very good discussions under that order of businsss. The first one was brought out by Mr. Charles Blackwell on the bending of steel and iron at dangerous temperature known as the blue heat. The important point made in the discussion was that it would be a good plan for railroad boilermakers to follow the recommendations of the American

Boilermakers' Association and cease working steel when the color fades below cherry-red. There is no doubt that many sheets are weakened and fractures started by working boiler sheets at the brittle temperature.

There was an exceedingly animated discussion on compound locomotives led off by Mr. Vauclain, who was at once recognized as an exceptionally able speaker and debater.

As our limited space prevents us from giving a satisfactory report of the work done at both conventions we leave the proceedings of the Master Mechanics' Association for publication in our next issue.

THE VERTICAL-PLANE COUPLER IN THE MASTER MECHANICS' CONVENTION.

For a year or two after the Master Car Builders' Association established the vertical-plane coupler as standard there were many master mechanics who looked upon the type chosen with serious misgivings and this led to the appointment of a committee to report on "The present status of the car-coupler question, and whether the convention can indorse the action of the Master Car Builders' Association from a mechanical standpoint in recommending the vertical-plane type as a standard." That was done two years ago, and last year a non-committal report was made and the committee was continued. At the Cape May convention another verbal non-committal report was given and it was immediately followed by a resolution presented by Mr. Wm. Garstang as follows:

"It is the sense of this convention that the use of the vertical-plane coupler is a move in the direction of progress, and that the committee be continned with power to represent this association before the Committee of Railroad Commissioners on Safety Appliances." This resolution was unanimously adopted, and its obvious meaning is that the Railway Master Mechanics' Association indorses the vertical-plane coupler. The drift of the resolution was evidently not clearly understood by those who voted upon it, or there might have been some opposition. It will be remembered, that a good many of the members of the Master Car Builders who voted when the vertical-plane type of coupler was first indorsed by their association, voted aye through a misunderstanding of what the question was.

STEAM SAVING EFFECTED BY COMPOUND LOCOMOTIVES.

We commend to our readers a careful perusal of the article on another page on the Progress of Compounding, by Mr. Harris Tabor, whose name is familiar to engineers the world over as inventor of the Tabor indicator. Mr. Tabor is one of the most accomplished steam engineers in this country and his views on the question of compound locomotives are well worthy of consideration. It will be seen that he takes a very moderate view of the saving that can be effected by compounding, but the comparison he wishes to make calls for a form of simple locomotive that appears to be more efficient in theory than it is in practice. It has been repeatedly asserted by other steam engineers that a simple locomotive with very large cylinders and the valve gear so designed that steam could not be carried further than half stroke would secure most of the advantages gained by the compound, but the theory has been reduced to practice repeatedly and the expected gains were not obtained. There are also practical difficulties in the way of making a simple locomotive that will start a train freely and not have the steam cut-off protracted beyond half stroke. It is, however, undeniable that a point of working can be found where the simple engine approaches very closely the best economical performance of a compound locomotive. Those who have been able to make comparisons of the two types of engines in parallel service are aware that in working light a simple engine uses no more steam than a compound and in some cases less. This fact gives a constant reminder that a compound locomotive must be employed doing heavy steady work to secure the maximum gain due to the increased expansion of steam practicable with this form of engine. The common ratio of the high and low pressure cylinders of compound locomotives has been 1:2, the low pressure having about twice the piston area of the high pressure cylinder. Decreasing the cylinder ratio will make the engine more economical when working light and increasing it will render the engine more wasteful when a small volume of steam is employed.

The moderate views which Mr. Tabor takes of the saving that can be effected by compound locomotives are in decided contrast with the claims frequently expressed. It is nothing uncommon to hear the claim made that certain compounds save from 25 to 40 per cent. of the fuel used by simple engines in doing similar work. We are familiar with cases where one form of simple engine has saved from 25 to 40 per cent. of the fuel burned by another simple engine doing similar work. All steam engineers are familiar with the same thing in stationary engine practice. It does not prove, however, that the simple engine is so wasteful *per se*, but that it is wasteful when put to work beyond its capacity. The comparisons that credit compound locomotives with a saving of 40 per cent. are not fair, because a heavier simple engine would show a material saving. The proper basis of comparison is a well designed simple engine of the same boiler and cylinder capacity as the compound. In such a case the compound will do very well if it effects a saving of 20 per cent., and part of that will be due to the increased efficiency of the boiler.

WRONGS OF PATENTEES.

A patentee in airing some of his grievances in our correspondence columnsmakes a point well worthy of the attention of those who have patents to dispose of. He says, "A patent is property just as much as a farm or a house or a horse. When a person wishes to purchase any of these things he makes his own investigations in finding out its value, and the owner would consider it a piece of impertinence if a prospective buyer asked him for twenty dollars to pay the expenses of looking into the value of the property. It is just as impertinent for a man or company which pretends to be anxious to purchase a patent to ask the owner to pay a large preliminary fee." This is a plain statement, well worthy of being kept in mind by those having patents to dispose of.

We know of no class that is habitually so cruelly deceived and swindled as poor inventors. A man labors for years inventing a device which he considers is likely to bring him wealth and credit, and he scrapes together with the greatest difficulty the money required to pay the expense of securing a patent. When the patent papers are issued he intimates to parties using the machinery which his patent is expected to improve that his patent is for sale, but they display no disposition to purchase the right to use the invention. Others are tried with a like result, and the patentee begins to realize that the troubles of the inventor do not end with the perfecting of the device. It looks as if his arduous labors had all been wasted. When his hopes of exciting the interest of those who ought to adopt his invention begin to droop he remembers that he has received numerous applications from patent agencies to permit them to handle his invention. They express the belief that it is a valuable invention, and it is natural that in his extremity the poor inventor should be drawn towards people who seem to understand a good thing when they see it. He corresponds with the agency and learns that a preliminary fee of $10 is necessary to advertise the invention, and he pays the money,although the sum is badly needed in his household. The money is gone and time passes, but there is no word of a purchaser. The agency is again written to, and great regret is expressed that a customer has not been found, and it is stated that more advertising ought to be done, and every cent of money that he can raise will be invested into that channel,which is like pouring water into a sandpit.

The patent agency appears under a variety of guises, a favorite one at present being a union or company of inventors, where an inventor, on paying a fee, is reputed to become a member. It is merely a change of name. The intention of the organization is precisely the same as the object of the patent agency, viz., to make money out of inventors.

If an invention possesses sufficient merit to give any promise of a fair return to investors there is not generally much difficulty in getting capitalists to interest themselves in it. If it does not have decided commercial value, the spending of money advertising it is merely taking away by false pretenses the resources of those who can ill afford to waste money. Patent agencies and all their equivalents are formed to prey upon the unfortunate.

ADVANTAGE OF TEMPLATES.

The action of the Master Car Builders' Association in requiring the Executive Committee to have templates made showing the standard lines of the Master Car Builders' coupler, is a move in the right direction, and one that might be greatly extended with advantage to railroad companies. The attempts that have hitherto been made to maintain the dimensions of Master Car Builders' standards by means of drawings have been complete failures. A drawing gives too wide latitude for making mistakes in measurement, and they are remarkably close mechanics who measure sufficiently close to make pieces interchangeable that are constructed from drawings. It is well known that no manufacturer would venture to construct from the drawing in the M. C. B. reports any of the articles that are standards of the association, because nearly all roads have made the parts according to their own measurements, and varying in important particulars from the sizes used by other roads. There are a great variety of different sized standard car brasses and wedges, the standard brakeshoes are seldom interchangeable, and even the large M. C. B. axle is already said to be made to different dimensions. When this sort of practice exists there is no use establishing standards without providing the means of maintaining them. The simplest way to do this is by providing templates from which no deviation can be allowed.

The association ought to furnish gauges and templets wherever they can be used in connection with standard parts, and they should be made by experts in the business, provided with all the necessary apparatus for maintaining exact sizes. It would be a good plan for the Executive Committee to make an arrangement with the Pratt & Whitney Company, or with some other firm engaged in making gauges, to supply the gauges and templets, as has been done by the Master Mechanics' Association in regard to wheel gauges. The rule that permits a railroad company to repair a foreign car with any standard of the association, even if it is different from the part renewed, supplies a new reason for an energetic effort to keep standards of uniform size, and we see no way of doing that unless by supplying templates from a reliable source of manufacture.

MALLEABLE-IRON AND STEEL CASTINGS.

The Dayton Malleable Iron Co. have written us a very emphatic letter about the item that appeared in our last issue where it said that "current practice does not indicate that malleable iron has any recognized position in car construction." The following is an extract which explains itself:

"We cannot but think that this statement is a misprint, or has been written by some one who knows not what he is writing of. The fact that a dozen, at least, of very large malleable iron works in the country are making a specialty of car castings, would *seem* to indicate that malleable iron had a very prominent place in car construction, and that it has been largely used for the last ten years would also indicate that it was satisfactory to the railroad companies."

Several others interested in malleable iron have expressed more or less resentment at the statement, and we are inclined to believe that a mistake was made. The subject of "Malleable Iron for ar Construction" was discussed in our columns at great length last year, some of those taking part in the discussion being men who were using large quantities of malleable iron in car construction. There was considerable diversity of opinion as to the merit of the metal, the complaints against it being based mostly on experience with malleable-iron castings that were unworthy of the name. A discussion on malleable iron vs. steel has evidently been started in our present issue, and we will be glad to give space for both sides of the question. If the genuine malleable-iron workers could stop the purchase of that metal from parties who merely pretend to make it while supplying common cast iron, they would put their material in a much more favorable position with railroad men than it now occupies.

Our correspondent, J. J. Clair, directs attenti on in his letter published in another column to the inconvenience of arrangement inside the cabs of some of the newer types of passenger locomotives. The designers of these engines are not properly impressed with the fact that one man has to do most of the looking for signals and obstructions on the track. The engines are frequently built with the engineer's position so crowded between a high boiler and an inconvenient cab that he can merely see ahead on his own side and he can see nothing 50 feet in front of the engine on a curve. In some cases the railroad commissioners have decided that where a locomotive is so constructed that the fireman cannot assist in keeping a lookout an extra man must be employed. If an accident should happen through the engineer failing to see a signal or obstruction owing to his vision being obstructed by the engine attachments we have no doubt that a general demand will be made for a third man in the cab. The way to escape the expense of this change is to design engines with the understanding that the engineer has to keep a constant lookout in front.

There is said to be something approaching mutin among the trainmen on the Chicago & Eastern Illinois because a division superintendent has issued an order prohibiting the stopping of freight trains at an eating-house long enough for the men to take lunch. The superintend ent is a devotee of the lunch bucket—for others. It is of the aggravating acts of petty tyranny like this that the source of fierce discontent among railroad employees is made up. Small officials clad in brief authority exert themselves to make life a burden to those they rule over. When the harvest sown is ripe trouble arises between the management and the employees, and the discovery is made that the men are unreasonable and have no interest in the welfare of the company they have long served. The blind manager does not see that his incompetent underlings have driven all *esprit de corps* out of the service. When this happens it is natural and fair that the men should screw the last cent out of the company in settling upon an agreement about wages.

The report of the Master Car Builders' Committee on "Air Brakes for Freight Cars" gives a strong incentive to the introduction of metal brakebeams and consequently the abandonment of the wooden brakebeam which is utterly unfit for cars having air brakes. The invention of metal beams to supply the acknowledged want promises to be quite equal to the demand. At the Cape May Convention there were no less than five metal beams exhibited, all of them capable of meeting the requirements of the association's committee.

We have received the "Official Railway List" from the publishers in the Rookery, Chicago. This is one of the most useful publications that reaches us, and we find that the issue for 1891 is a little ahead of those that preceded it in the information furnished and in the convenience for finding names. The list is sent free to the railroad men named in it, and others can have it for $2.00, and it is cheap at the price.

Personal.

Mr. Charles H. Dunham, the well-known railroad supply man, died suddenly at Chicago last month.

Mr. J. N. Barr was called away from the Railway Master Mechanics' Convention by the sickness of his wife.

Col. J. Y. Sage, who became well known for his able management of the Georgia Central, has been elected president of the Atlanta & Florida.

Mr. J. M. Barnard, assistant general manager of the Cleveland, Cincinnati, Chicago & St. Louis, has been transferred to the Southern divisions and made superintendent.

Mr. H. S. Fowler, well known to many of our readers in connection with the Fowler car wheel, has accepted the position of contracting agent for the Field feed-water purifier.

Mr. John W. Hobart, general manager of the Central Vermont, resigned a month ago after having been with the company over 40 years. He rose through various grades from the position of clerk.

Mr. Harvey Middleton, the well-known superintendent of motive power, has accepted the position of superintendent of construction of Pullman's Palace Car Company, with headquarters at Pullman, Ill.

The position of master mechanic of the Long Island Railroad has been abolished, and Mr. C. A. Thompson, who has held that office, has been raised to the higher dignity of superintendent of motive power.

Mr. Rollin Manville, superintendent and purchasing agent of the Pennsylvania division of the Delaware & Hudson Canal Company, died of consumption last month. He had been with the company since 1856.

Mr. R. D. Wade, superintendent of motive power of the Richmond & Danville system, has had his jurisdiction extended over the Georgia Central, and Mr. A. W. Gibbs becomes assistant superintendent of motive power.

Mr. G. R. Joughins, who went from Canada about a year ago to be master mechanic of the Norfolk & Southern Railway, has lately been made superintendent of motive power. He is one of our brightest mechanical engineers.

Mr. E. H. Barnes, who was for several years superintendent of the Georgia division of the East Tennessee, Virginia & Georgia, has been appointed commissioner of the Georgia Car Service Association, with headquarters at Atlanta.

Mr. George Royal, Jr., who has been for several years an engineer on the Wisconsin Central line, has left, to accept a traveling position with Coolbaugh, McMunn & Pomeroy, New York, the National Car Spring Co. and the Ajax Metal Co.

Mr. M. M. Reid, a very bright young mechanic, who has been for some years a foreman in one of the Baltimore & Ohio shops, has been appointed general foreman of the Norfolk & Southern shops at Berkley, Va. He is particularly well posted on matters connected with piece work in railroad shops.

Mr. James C. Converse, president of the National Tube Works, of McKeesport, Pa., and formerly a prominent merchant of Boston, died in Greenfield, Mass., May 25. Mr. Converse was one of the projectors of the Hoosac Tunnel, and was also at one time state railroad commissioner of Massachusetts.

Prof. A. T. Woods, well known to our readers as a writer on compound locomotives and other engineering subjects, has resigned the chair of professor of mechanical engineering in the Illinois State University and accepted the chair of professor of dynamic engineering in Washington University, St. Louis, Mo.

Mr. W. H. Rosing, assistant master mechanic of the Illinois Central, has resigned to enter the employ of the Grant Locomotive Works, of Chicago. Mr. Rosing is a graduate of a French technical school, and has received an excellent engineering training. He was for several years chief draughtsman of the Illinois Central.

Col. George G. McWhorter, railroad commissioner of Florida, and formerly Chief Justice of the State Supreme Court, died at his country home at Milkins, Fla., a month ago. Colonel McWhorter was president of the Railroad Commission from his appointment until he resigned a few weeks ago on account of failing health.

Mr. John Black, elected an honorary member at last convention of the Master Mechanics' Association, joined the association in 1870, when he was master mechanic of the Cincinnati, Hamilton & Dayton. He attended the conventions very regularly and took a lively personal interest in the proceedings, but did not talk much.

Some of those who attended the Master Mechanics' Convention were inclined to compare the conduct of President Mackenzie with that of Prince Hal, the companion of Fallstaff, who displayed so much dignity when he ascended the throne. Outside, Mac is noted for his love of fun; as president he was all dignity and business.

Mr. Chauncey Vibbard, who was once a famous railroad man, died at Macon, Ga., last month. He began railroad work on the Utica & Schenectady Railroad in 1836, and rose to be general superintendent of the New York Central. During part of the war he was director and superintendent of the military railroads of the United States.

Mr. G. W. Rhodes, superintendent of motive power of the Chicago, Burlington & Quincy, is a peculiarly retiring and modest man, yet he is exceedingly popular with the men under him. He takes a great personal interest in promoting the advancement of his master mechanics and young assistants, and they display great attachment to him.

Mr. H. Monkhouse, who has been for some time assistant general master mechanic of the Chicago, Rock Island & Pacific system, has been promoted to the position of assistant superintendent of motive power and equipment, with headquarters at Horton, Kan. Mr. Monkhouse is a graduate of the Baltimore & Ohio, and is noted for his ability in handling men.

One of the brightest young men to be seen at the late mechanical conventions was Mr. Clarence H. Howard, lately appointed general manager of the St. Charles Car Works, St. Louis. Mr. Howard left the Scarrit Furnitnre Company to accept the present position. He is a machinist by trade, and has held several good railroad and manufacturing positions, all of which he filled with the highest credit that commended him for advancement.

Mr. Joseph Ramsay, who has been for several years assistant to President Ingalls of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed general manager of that road to succeed Mr. William M. Green, resigned. Although a comparatively young man Mr. Ramsay has had a varied railroad experience and he is reported to have good capacity for handling men and in dealing with difficult problems that so often arise in railroad management.

Mr. E. B. Wall, superintendent of motive power of the Pittsburgh, Cincinnati & St. Louis, has been the central figure in two episodes during the month passed. In the first place he was married, and secondly he was elected president of the Alumni Association of the Stevens Institute. He also moved certain resolutions in the Master Car Builders' Convention, but he did not act with his usual *sang froid* at the meetings, the cause now being perfectly apparent.

Mr. A. A. Allen, general manager of the Chicago & Northern Pacific, the company which controls the Chicago terminals of the Northern Pacific, has resigned, and Mr. S. R. Ainslie, general manager of the Wisconsin Central, will probably have jurisdiction over the terminals. Mr. Allen was formerly general superintendent of the Wisconsin Central. He intends taking charge of the construction of a railroad in Washington in which Mr. C. L. Colby is largely interested.

Mr. Oscar W. Petri, technical attaché of the German legation at Washington, attended the Railway Master Mechanics' Convention for the purpose of taking notes of the proceedings. He was invited to a seat on the platform by President Mackenzie and pleasantly introduced to the meeting. Mr. Petri has been in this country three years and he is now about to return home. He has made numerous friends in America and is a great admirer of our engineering enterprise and energy.

Mr. E. T. Jeffery, president of the Grant Locomotive Works, Chicago, and for years general manager of the Illinois Central Railroad, was elected an honorary member of the Master Mechanics' Association. He joined the association in 1874 when he was assistant to Mr. S. J. Hayes, superintendent of motive power of the Illinois Central. He took an active part in the proccedings of the association as long as he remained in the mechanical department, and was prominent on committees.

Mr. Geo. F. Wilson, general master mechanic of the Chicago, Rock Island & Pacific, has had his jurisdiction extended over the car department with the title of superintendent of motive power and equipment. Mr. Wilson effected a very material saving in the operating of his department last year through the introduction of improved methods that increased the efficiency while diminishing the expenses. He is already becoming marked as a good man, and more than one general manager is anxious to learn if Mr. Wilson is wedded to the Rock Island.

One of the best entertainments gotten up during the conventions at Cape May for the amusement of the visitors was the legerdemain feats of Mr. E. S. Canman. The exhibitions of rare skill were given under great difficulties due to want of complete apparatus and assistance, but we have witnessed few professionals who were much better than Mr. Canman. Besides proving himself to be an expert magician, this young man, who is the accomplished son of the Chicago *Tribune's* well-known railroad reporter, "Bismark," was a valuable addition to the conventions, owing to the industry he displayed in promoting the comfort of the visitors.

At the twenty-fifth convention of the Master Car Builders' Association held at Cape May last month the following officers were elected for the ensuing year: John Kirby, president; E. W. Grieves, first vice-president; J. S. Lentz, second vice-president; T. A. Bissell, third vice-president; J. W. Cloud, secretary; G. W. Demarest, treasurer. At the Railway Master Mechanics' Convention held at the same place the following officers were elected: John Mackenzie, president; John Hickey, first vice-president; William Garstang, second vice-president; Angus Sinclair, secretary; O. Stewart, treasurer. These two sets of officers will form a joint committee which will decide on the next place of meeting.

Mr. John F. Divine, general superintendent of the Wilmington & Weldon, who was made an honorary member of the Master Mechanics' Association at last meeting, joined at the third convention and has been one of the most regular of the members in attending the meetings. He was master mechanic when he joined the association, but he has long held the position of general superintendent; yet his interest in the proceedings of the association is as keen as ever and he attends the conventions regularly and is constantly to be found in the meetings. Although a quiet man, not given to asserting himself publicly, he entertains very sound and decidedly advanced views on most mechanical questions.

Of the seven members of the Railway Master Mechanics' Association who were elected honorary members at last convention Mr. Jacob Johann has had the longest connection with the association. He joined in 1868 at the first meeting and was entered as late of the Pacific of Missouri. Mr. Johann had been in railroad service ten years before that time and had been seven years master mechanic. In 1870 he became general master mechanic of the Missouri Pacific, and from that time till three years ago he has always held prominent railway positions. He is now Western agent for the Safety Car Heating and Lighting Company. Mr. Johann has been one of the most active and useful members of the Master Mechanics' Association, and was president for one year.

An incident at last Master Car Builders' Convention struck us forcibly as an illustration of how quickly public services are forgotten and how promptly a man falls into obscurity unless he keeps pressing into notice. Mr. C. A. Smith, superintendent of the Standard Oil Company's Union Trunk Line, had been talking to some friends about the late Mr. Verbryck, and when he got up and walked away a member, who of late years has become prominent in the association, asked who the old gentleman was. It sounded strange for a member of the Master Car Builders' Association not to be acquainted with Mr. C. A. Smith, who was secretary of the association for ten years and did more than any other man to fan its flame of life at various times when the organization was in a moribund condition.

Mr. J. Mulligan, president of the Connecticut River Railroad, who was elected an honorary member of the Railway Master Mechanics' Association at last convention, joined in 1869, at the second convention, held at Pittsburgh, Pa. Mr. Mulligan was then master mechanic of the road of which he is now president. He took an active part in the proceedings of the association, and we find that at the next meeting after he joined he was a member of prominent committees. He had been in railroad service 27 years when he joined the association, having begun work as a machinist on the Western Railroad in 1842. Then he was locomotive engineer, rising from that to be master mechanic. Mr. Mulligan became general superintendent a few years after joining the association, but he always kept up his interest and membership.

Mr. Morris Sellers, who has been elected an honorary member of the Railway Master Mechanics Association, was for years one of the most active and useful members of the association. He was looked upon as a scientific and practical man combined. An excellent speaker, he was at home with any subject brought up, and was always ready to give assistance in the work of investigation or in framing resolutions. He joined the association at the second convention, and was a prominent member for about ten years. At the third convention he read a paper on combustion which attracted the attention of the scientific world, and was widely quoted. Mr. Sellers is now a prominent business man in Chicago, and is proprietor of a rolling mill devoted to making the Samson splice bar. There is no more genial or generous man in Chicago, and he is one of the best story tellers of our acquaintance.

Many of the older master mechanics who attended the Cape May conventions renewed acquaintance with Mr. Dyer Williams, an old-time master mechanic, who is the inventor of the Williams car coupler, that attracted no small attention on its own account. Mr. Williams began railroading 49 years ago as fireman on the Utica & Schenectady Railroad. After firing three years he went into the shops of the Mohawk & Hudson Railroad, and

served an apprenticeship to the machinist trade under Mr. Walter McQueen, Mr. William Buchanan having been a fellow apprentice. After that Mr. Williams went running a locomotive, and left the road to take out engines for the Schenectady Locomotive Works. Next he was master mechanic on the Michigan Southern, and subsequently he held the same position on various other roads, including the middle division of the New York Central. He is now proprietor of a foundry and machine shop in Cedar Rapids, Ia.

Benjamin K. Verbryck.

In the early days of June a host of his friends and acquaintances were surprised and grieved to hear of the unexpected death of Mr. Benjamin K. Verbryck, general master car builder of the Chicago, Rock Island & Pacific Railway. Mr. Verbryck was born in New York State in 1827, and was therefore 64 years old at his death, but he was an active, vigorous man, with the appearance of health that promised many more years of life. When a young man Mr. Verbryck learned the carpenter trade, and he was for some time a school teacher, and for several seasons was in the habit of working at his trade in summer and teaching school in winter. Then he went to work in the car shops of the Erie at Piermont, where he soon rose to be foreman. His ability as a foreman commended him for a higher position, and he was engaged in 1871 as master car builder of the Chicago, Rock Island & Pacific, where he remained during the rest of his life.

Mr. Verbryck was an active supporter of the organizations formed to advance railroad rolling stock interests, and was president of the Master Car Builders' Association for two years. He was a prominent member of the Western Railway Club, and was president of it for one year. He was a ready speaker and informed himself carefully respecting the merits of the questions coming up for consideration.

BENJAMIN K. VERBRYCK.

At the last Master Car Builders' convention a resolution of condolence on the death of Mr. Verbryck was adopted.

A few days ago a very peculiar casualty occurred on a road in Northern Illinois. While a train was passing over a piece of double track a walnut log, 12 feet long, and 19 inches across the butt, fell from a car and rolled over onto the second track, where it remained in a lengthwise position, and midway between the rails. A 19-inch freight engine came along shortly after on the track obstructed by the log, and the pilot struck it fair on the end. It split the log from one end to the other, and threw one-half to one side of the train and the other half on the other side. The train was not delayed by the occurrence, and there was no damage done to the engine or pilot. The split was in a winding shape on account of the grain of the log, and was just about as it would be split by wedges. This may seem to some railroad men as incredible, but we have the information from a railway official who saw the log immediately after it was split.

Communications.

High Express Engines.

Editor National Car and Locomotive Builder:

The new class of passenger engines recently put in service by the B. & O. on its fast trains between Philadelphia and Washington have evidently come to stay, and it is said more have been ordered. Those engines have cylinders 20 inches by 24 inches, driving wheels 72 inches, centres with three-inch tires. It is a pity, however, that leading driving wheels are not flanged, for, while not greatly increasing the smooth running or easy riding, yet engine would haul train better, slip less and be safer with flanged tires.

Engineers say that on runs between Baltimore and Philadelphia, where it has been difficult to make up five minutes lost time with the 19-inch by 24-inch cylinder, 69-inch driving-wheel class, the new engines will easily make up 10 or 15 minutes. While it takes some little distance to get those large engines going, a high speed can be well maintained, and on some portions of the road, it is claimed, seventy-five miles per hour has been made for considerable distances. The road is comparatively level, with some slight grades 20 to 40 feet; the curves are not heavy and the roadbed is in good condition. Engineers are inclined to think favorably of the new engines, even if they are very large and high, but complain of the cabs being very hot, and of a very insufficient view of track. It is a pity that a better arrangement of cab than prevails cannot be devised for modern express locomotives. The engineer, as a rule, is seated low down along the side of the boiler, where whistle, throttle, etc., are not always in convenient and easy reach; besides, a high boiler, sand-box and large headlight-box completely obstruct a view of track even when running through very moderate curves; while on roads with heavy curves the view of track is entirely obstructed for large portions of trip.

J. J. CLAIR.

Responsibility for Extra Car Attachments.

Editor National Car and Locomotive Builder:

In the May number of the NATIONAL CAR AND LOCOMOTIVE BUILDER a decision is reported from the M. C. B. Arbitration Committee that seems to some a trifle anomalous; to wit, case of Pittsburgh & Lake Erie vs. Erie for loss of coke rack when car was wrecked.

The committee is reported as holding that, under the present rules of interchange, the Erie was not responsible for the rack, or, as claimed by the Erie, the "extra attachments." If the Erie received the car with coke which required the rack, then clearly mutual interests were involved. If the Pittsburgh & Lake Erie company were to sue the Erie company in a magistrate's or other court the railroad people would be enlightened upon the ancient law of bailments; that is, "the delivery of a thing in trust for some special purpose upon the expressed or implied promise on the part of the bailee to conform to the object of the trust," the third classification of which is "those which the trust is for the benefit of both parties." The common-law doctrine is: "Ordinary diligence on the part of the bailee, and makes him responsible for ordinary neglect."

It seems to an ordinary mind that the loss of this property or rack was by the fault of company handling car through unfair usage. The Court would charge the jury that on all questions of fact, if they found the coke rack was a substantial and material part of the car for the purpose of transportation, that the bailee would have to make good the loss of the property, also leaving to the jury to determine the value of the rack if twenty-eight dollars was disputed.

Rule 2 of the M. C. B. Code is the governing rule directly in the line of this doctrine of bailments, requiring the article to be "returned in as good general condition as when received."

What was to prevent the settlement of the coal car part on the basis of Schedule Rule 23, and leaving the question of fact to a local committee to determine the extra value of substantial attachments, the rack or movable property, if value is disputed. Such racks are generally substantial, material and valuable, painted and fitted to car and kept for that purpose of coke trade. We are vouchsafed by the fundamental law of the land that persons cannot be deprived of their property without due process of law. To end this off pleasantly I must tell a little story. In my village a man had been constable for a number of years. Finally the people thought that for faithful services he ought to be promoted, so they elected him Justice of the Peace. His grade of intellect and powers of analysis had been left untrained in his early days. Among those who congratulated him on his election was a dry wag who wished him success, which he assured would follow, "if you do not err; but if you do err, why then err a little on the side of justice." EX-JOINT INSPECTOR.

Malleable Iron in Car Construction.

Editor National Car and Locomotive Builder:

Appearing in your June issue is an article relating to "Pressed Steel and Malleable Iron in Car Construction," which, the writer believes, does a great injustice to the malleable iron interests in the country. We believe that had the writer of the article in question considered the matter more thoroughly he would not have used such language. In the standard specifications of the great majority of the railroads and private car companies more or less malleable iron is called for, and were it not for unjust criticisms the maker's name would be specified. This shows clearly that *malleable iron* has a recognized place and value. It is also true that objections exist, but they are chargeable to the poor quality made and used by those who have either no pride in the matter or choice in the manufacturer. This perhaps was brought about by a desire to meet a price which it was suggested "that malleable iron could be produced for." Those who have used malleable iron the most and longest are its best advocates, clearly demonstrating that a good quality has a recognized standing and meets the requirements for parts for which reputable makers recommend it. Statistics show that many millions of dollars are invested and several thousands hands employed in the manufacture of malleable iron, and the demands for the best grades of the product are increasing. The writer cannot believe your valuable paper would do anything to reflect discredit on the malleable iron interests of the country, but the writer of your article is mistaken in assuming that malleable iron is likely to have no permanent place in car construction.

GEO. W. MCGUIRE.

The Great Future of Malleable Iron.

Editor National Car and Locomotive Builder:

In the June number of the NATIONAL CAR AND LOCOMOTIVE BUILDER there are some remarks about malleable iron that may strike the casual reader as being correct, when, as a matter of fact, they are the reverse of being true. I allude to page 91, where I find it said: "Current practice does not indicate that malleable iron has any recognized position in car construction." That remark has no doubt been drawn out owing to the complaints against malleable iron that are heard so often, and are due to the number of concerns that have entered into the making of malleable iron without having the plant or the experience to do the business properly. The best friends of the malleable iron industry sadly admit that there is a vast quantity of stuff sold for malleable iron that is little better than common cast iron, but that is not the blame of this really valuable metal; it is the blame of unscrupulous persons who offer an article for sale which is far from being what it is represented to be; and it is in no small measure the blame of the buyers who go to the cheapest market without exercising common care to see that they get what they are supposed to pay for. If the buyers would insist on making tests to see that reputed malleable iron was malleable iron, a good many concerns would soon shut up shop, but there would be fewer people talking of going from cast iron to steel.

Steel castings is a material of many promises which so far have mostly been broken. Before all things, the ma-

terial for car construction must be reliable. Will any one guarantee steel castings? Experience does not point to an answer in the affirmative. No material that has ever been used for car construction has equaled cast iron for reliliability to withstand the shocks and strains within its recognized strength. There is no uncertainty about iron castings when made by people who know their business. Now, malleable iron is just an extension of the good iron casting, and there is no fear of failure in making the material what it is represented to be if skill and care are exercised in its production.

The field for malleable iron in car construction is on the increase instead of not being there. The vertical plane coupler and the iron or steel brakebeam naturally call for malleable iron. The only reliable vertical plane couplers in use are made of malleable iron. If master car builders worked with a single eye to the interests of the companies they draw salary from they would make the principal truck castings of malleable iron and thereby greatly reduce the dead weight carried. There are too many men in railroad life who do things just because their grandfathers did them. If there was more intelligent desire to find the fittest material and use it, the malleable iron industry would be one of the greatest in the land, and no railroad paper would say anything to disparage that kind of metal.

R. W. C.

Steam and Water as Heating Mediums.

Editor National Car and Locomotive Builder:

Referring to the article by Prof. W. S. Johnson, on steam heating, read at the May meeting of the Western Railroad Club (of which I am a member), we beg leave to say that the professor is correct in his comparisons between water and steam heating for railroad cars.

As to regulating the temperature of steam heating, it cannot be done, for the simple reason that the mere presence of steam in the heating pipes unavoidably makes them too hot; and, of course, it cannot be regulated except within the desired range of temperature, and that range of temperature exists below the lowest point of steam.

Overheating of cars where bare steam pipes are used, therefore, cannot be remedied; and discomfort, disease, etc., created by hot pipes charring the myriad particles of vitiated matter peculiar to railroad cars, will always exist with steam heat.

The question does not admit of a doubt that hot water is the only proper medium for imparting artificial warmth to human dwellings, whether on wheels or stationary. The very fact that water is susceptible of being heated to, and imparting its heat at, any degree suited to the weather, proves it to be the only element adapted to the purpose.

As to the size of pipe—taking everything into consideration—14-inch (the size invariably used) is the best. The larger the pipe the more water it will hold, and the more water it holds the larger the expansion chamber, or drum, must be. The size of the pipe is also the size of the generator coil, which cannot be enlarged and still allow ordinary size fuel to burn freely around it, as it must in the Baker heater.

All of these matters were the subject of a great deal of investigation and testing by me before the Baker heater was originally put on the market.

In regard to Mr. Gibbs not getting proper circulation of water with moderate heat, no difficulty whatever exists in this respect where the Baker heater is properly constructed, and managed according to the few simple rules given.

W. C. BAKER.

Woes of the Poor Inventor.

Editor National Car and Locomotive Builder:

I have at divers times invented what the Patent Office authorities have been pleased to call, "new and useful improvements" on railroad rolling stock. It is not generally understood that inventing things is a crime, but my inventions have brought me nothing but persecution, annoyance and loss of time and money. This is surely not the intention of the laws which ostensibly give encouragement to the industry of inventing. Yet my case is representative of the majority of those who are unfortunate enough to direct their minds to the inventing improvements on railroad machinery.

My experience with my first invention was not of a kind to encourage me to renewed efforts. I invented an improved valve, which I still feel assured could save at least 10 per cent. of the steam now used by a locomotive. But no one would give it a trial. When I called upon a master mechanic and asked him to use the valve he excused himself on the plea that the general manager did not care to try new things; and the general manager referred me to the master mechanic, who contrived to squirm out of trying the valve on various thin pretenses. On one road where I applied a set of valves at my own expense, and made a good record, the improvement was dropped because it was different from the standard—as if there can be any improvement by keeping to standard lines.

It might be supposed that this experience would cure me of inventing railroad devices; but an inventor cannot suppress the inspiration that comes to him, and my next venture was a car coupler, the best thing of the kind ever offered to an unappreciative railroad world. But I could not give it away to railroad companies, so it remains, like many other good things, switched aside by mediocrity that is backed by assurance and unfair interests. I need not speak of my bearing, my oil-box, my reducing valve and other inventions of solid merit. Railroad companies are not using them to any great extent.

Railroad companies have treated my inventions shamefully, but I must admit that they did not attempt to swindle me, which others did. The fact that I had become known as an inventor and patentee made me the object of attack by the meanest sharks that are to be found out of salt water. My life is made a burden by people who consider they have a right to possess themselves of my means, because I am a patentee. I am oppressed under a deluge of applications from people professing to be able to sell my patents, when their sole aim is to rob me of my money without giving any equivalent, and from others who profess that my patents need investigating. When I was less experienced in the business than I am now I was ensnared into advancing a sum of money to one concern that explained that the money was required for preliminary work. That was the end of it. The same end is the object of all the other attentions of the same kind so persistently urged upon me now.

I feel constrained to make a statement for the benefit of fellow-inventors and for the information of those who habitually prey upon inventors. A patent is property just as much as a farm or a house or a horse. When any person wishes to purchase any of these latter things he makes his own investigations in finding out its value, and the owner would consider it a piece of impertinence if a prospective buyer came and asked him for twenty dollars to pay the expense of looking into the value of the property. Now it is just as much an impertinence for a man or company which pretends to be anxious to purchase a patent to ask the owner to pay a large fee as a preliminary condition. If patentees and their pilferers would recognize this common business principle, patentees would not have their time taken up and their hopes raised to be blasted by patent-agency sharks.

PATENTEE.

Another Model Shop Plant.

Editor National Car and Locomotive Builder:

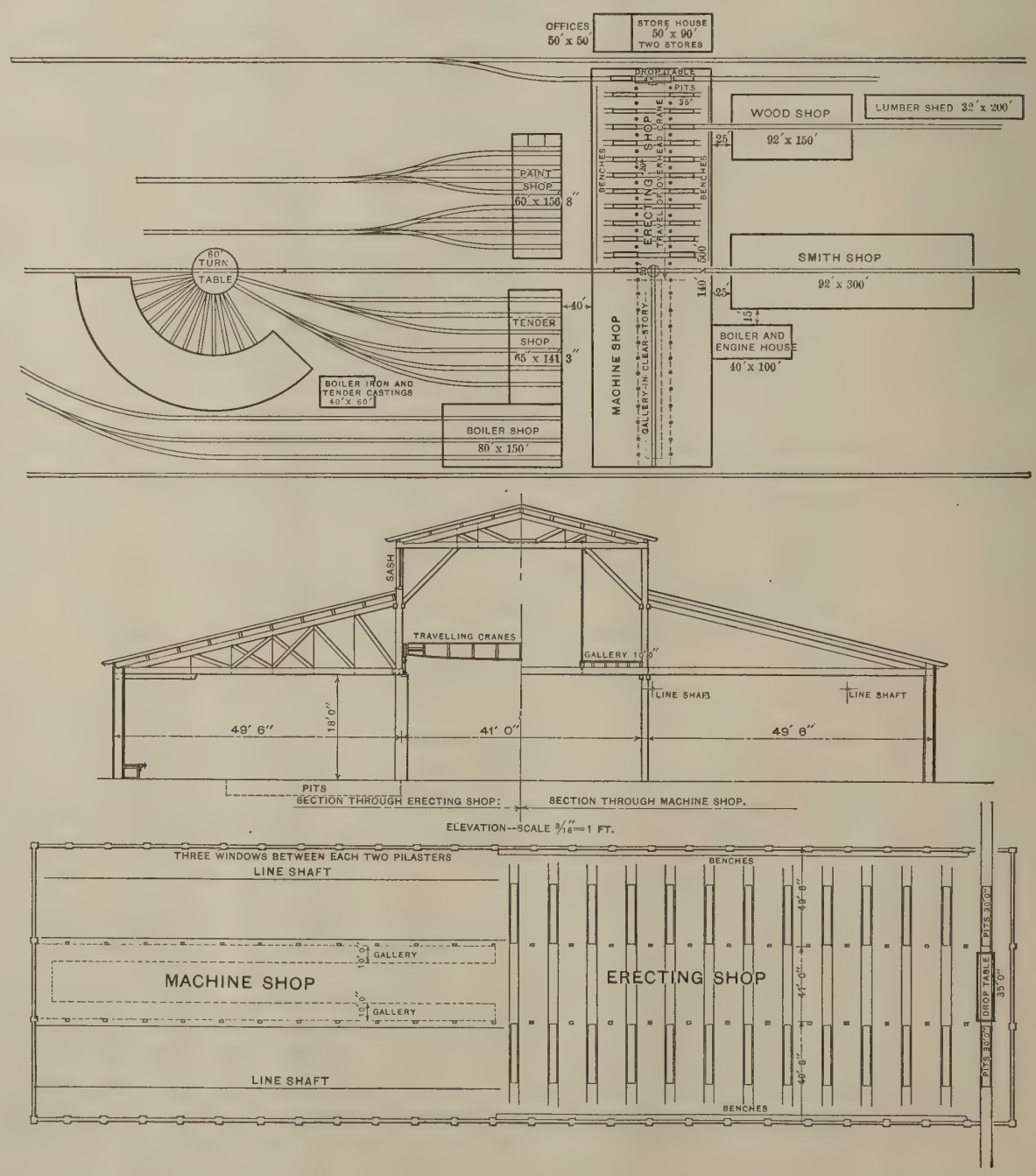
The question of shops is one of great interest to a shop manager, as to a great extent his success depends on their adaptability to the progression of work in its different stages with the least expenditure of labor. First, I would ask why, with a traveling crane overhead, capable of handling the heaviest engine, should we need, what has always been considered a nuisance, viz., a large ditch, generally placed where most of the material is handled, between the smith and machine shops? Of course large forgings are transferred by the table, but year in and year out, there is more time lost and labor expended in crossing this ditch than without it; besides, it ruins the erecting shop, as you can have but indifferent light in a shop that should have the best, the side of shop being taken up with doors, and in these doors the only windows. Next, you have no benches to speak of, being obliged to get them in where you can against a blank wall and depending on a cross light at best, and none generally. Again, very generally the power is applied to one end of the shafting, in this instance 500 feet long, with heavy machines at far end. This would necessitate a shaft running from about four and a quarter inches down to two and a half, and about 50 per cent. more power to drive than the same amount in 250-foot lengths, driven from the center.

Their construction is all that could be wished. A monitor roof with glass in sides, which, besides giving light, allows of such framing as to give the head room to put in the traveling crane without too high side walls. I consider 18 feet ample high for side walls, which should be built with very heavy pilasters, and anything for filling between them, only provided the space was mostly windows. Although I have not shown it, I think in making working drawings I should carry the roof of monitor on a light Howe truss, the lower chord of which should be heavy and come just between the head of rafters of main roof; thus all side thrust when lifting heavy loads would be transferred to the low heavy pilasters on both sides. Besides, this truss would carry galleries and timbers for shafting.

Now for the advantages I claim for shop as diagramed. First, good riddance to the ditch; next, a well-lighted shop, with benches directly in the light, and either the whole length of erecting shop on each side or preferably to me; every other space a small lathe, with one small drill press on each side of shop about midway. This would only call for a light shaft extending down each side, unless you wish to belt through too and drive the wood shop from the same motor as the machine shop.

The machinery will be grouped in the machine shop, and the heavy tools next to erecting shop, thus not only getting the benefit of the traveling crane, but as they have to be spread with space around them, it leaves openings through from the lighter machines behind them.

Regarding the distance from machines to engines on pits. First, it is no greater than the long one-sided shop; besides, in a properly managed shop, work goes from the machine to the pit only to be assembled and not to be fitted; while, with the small lathes as referred to, you not only have them near the benchmen, who may be on such work as would make it preferable, but you can fit bolts, etc., if needed; besides, if the galleries are used for light machin-



ery, link and rod work, etc., the machine-room could be shortened, although I would not recommend any decrease, as 500 engines, besides such bridgework, etc., as a road indicated, will crowd this size shop, especially the smith shop, if they work up their scrap. The shafting being in short lengths, can be light, and every shop, including the boiler shop, can be belted from one engine, or steam can be readily carried to any point. I would pull engines off and onto pit by a rope running down from crane and passing through permanent snatchblocks, they, the engines) resting on a set of trucks made for the purpose with adjusting screws, so as to level up and take the place of blocking while on the pit.

I show the wood and smith shops separated somewhat from main building, first for the great desideratums, light and air, and second to free the machine shop from dust and smoke. I have also widened them, as I find this as narrow as practicable to work double forges with room for steam hammers through the center. I have also altered their figures to some extent in size of boiler-room; first, would cut off about 35 feet for engine-room and then, placing boilers across the building, would have as little room as I could set five 60-inch boilers in, as I should set them separate.

I left the location of iron and casting shed to our chief draughtsman, and he put it in where it would look pretty, but, as he has put no figures in, suffice it to say I would crowd it up to boiler and tender shop as close as would clear tracks. Of course the track shown in smith shop would not run clear through, but to whatever extent the location of hammers would permit. You will understand I might change the locations of some of the buildings if I had not tried to conform principally to their ideas and confined myself to the introduction of what I consider a far superior machine and erecting shop, in the hopes of opening discussion that will lead to some improvement on what our forefathers had, even if my ideas are not so indorsed.

Are they to have no iron or brass foundries? I consider these as the most profitable shops connected with shops of this magnitude, but of course there may be conditions of which I am ignorant connected with these.

New York to Chicago in Eighteen Hours.

On June 22, owing to an accident in the car yard of the New York Central at Mott Haven, there was a long delay in getting out the cars to make up the Chicago limited express and the train started from New York two hours late. Orders were given to make up the lost time and the engineers throughout the journey ran as fast as their engines would pull the train. The run from New York to Buffalo, 439 miles, was made in 8 hours and 20 minutes, an average speed, including stoppages and delays, of 53 miles an hour. During one space where no call for reduction of speed was necessary, 38 miles were run in 36 minutes. The run over the New York Central was made so smoothly and regularly that few of the passengers knew that unusually fast time was being made.

The train consisted of six heavy coaches, which with the engine and tender weighed 717,500 pounds. The train was on time when it reached Cleveland. At the rate of speed, which was maintained without difficulty with this train, the run between New York and Chicago could be accomplished in 18 hours. When the demand arises, our ordinary master mechanics can show the kind of locomotive that can make the run to Chicago in 18 hours. And they do not require to run with a half train either.

Operation of Airbrakes.

When the report of the Committee on Airbrakes was read at the Master Car Builders' Convention Mr. G. W. Rhodes made a statement about the working of brakes that was full of valuable practical points, and manifested an unusual intimacy with the details of the apparatus. The following are the remarks slightly abbreviated:

In the instructions to enginemen there are some points which I think we ought to consider a little farther. Under "general," toward the end, is said, "The engineer's brake valve works properly in all different positions of the handle, and that when the brakes are fully applied, the driver pistons do not travel less than one-half or more than two-thirds of their stroke, and the tender-brake piston does not travel less than four or more than eight inches." Now take a quick-action brake. You have an auxiliary reservoir supplying air to the driver brake; sometimes you have an auxiliary reservoir of the freight size applying air to the one-tank cylinder. When you throw the brakes off, you throw back your excess pressure into the train pipe at about 120 pounds. It instantly throws off the tank brake, which has a pressure, on account of the short travel, of probably 60 pounds. On cars which have a longer travel, and on the drivers brake where there are two cylinders to be supplied, there are only 50 pounds. Now, while this 120 pounds is on the tender and train, you are storing up pressure in the tank about the normal of 70 pounds, and when the engineer's handle is put on the equalizing position the tank brake goes on again, because it has got a greater pressure in its auxiliary reservoir than the 70 pounds to which the train pipe is equalizing.

knowing engineer, when he finds his tank brakes are "sticking," invariably reduces the auxiliary pressure in the tank reservoir. I think the 4-inch travel is too short, and at our Western Railway Club we increased to five inches, but my recommendation is that it be six inches.

This second clause, "Engineers must report to roundhouse foreman at the end of the run any defect in the airbrake or signal apparatus discovered on the road"—that is a very good rule, and certainly ought to go in.

Now, in the last paragraph, "After the engineer is satisfied that there are no serious leaks in the train, he will, at a signal from the inspector or trainmen, apply the brakes, and leave them so applied until the brakes on the entire train have been inspected and the signal is given to release." The practice on our line is to give the same instructions, but we invariably tell our men to apply the brakes by exhausting all the air from the train pipe, and I think that is quite an important provision to put in there. It is important for several reasons. As an illustration I will say that on our line we had an accident on a mixed freight train. It was running with eight air-brake cars.

At one stop two additional air-brake cars were taken on and were put at the head of the eight already on, making ten air-brake cars. Approaching a crossing the train was expected to make a stop. The engineer supposed he could do so, but when it came to the final stop, to his astonishment his brakes did not hold, and an investigation showed that in place of having the brakes on the ten cars he only had brakes on two cars. In putting on the two additional cars they had overlooked inspecting the brakes, and the stop-cock was out, and the man, not being thoroughly posted about the brakes, had been applying the brakes and not paying any attention to the exhaust of the air. He didn't know from his application that he was not applying his brakes to his ten cars. Now, if the rules require exhausting all the air from the train pipe, the man can tell by the sound how many brakes he has got connected up; he is accustomed from his exhaust to know whether he has got a long train.

There are a number of other points in this matter which I would criticise, but I don't want to take up the time of the Convention now. However, it seems to me that if we act on these as they are now we will make no mistake. I would be disposed to refer this subject to a committee to revise, but if it was revised and submitted to letter ballot, perhaps that committee might get something in which might not be satisfactory.

Let us consider the question of the short travel on passenger cars, what will be the effect when we make a light service application, and only put on a small portion of the air. The leakage groove in the cylinder is 3 inches long, and the piston won't travel on beyond the groove with only light application, and the brakes will go on and come off again. Why that has been overlooked I do not understand.

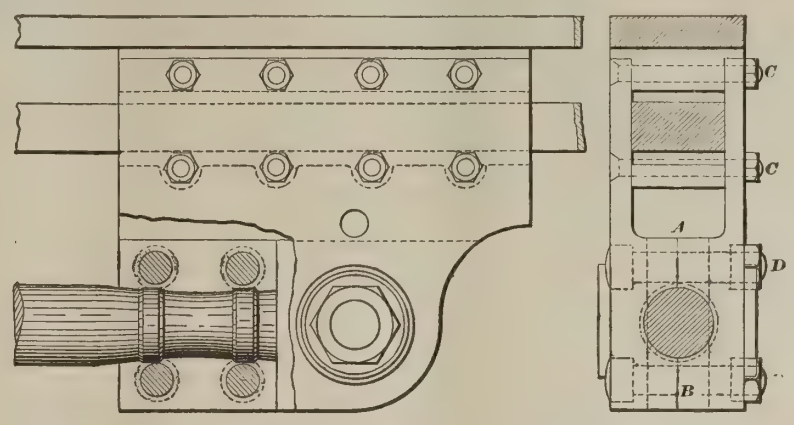
On page 4 the instructions say: "With freight trains which are only partially equipped with air brake, great care must be used to apply the brakes with only from 6 to 8 pounds reduction and to allow the slack of the train to be taken up before further application is made." That is to say, you apply the brake first and then let the slack run up. The way to do this is, let the slack come up and then apply the brakes when your train is only partially equipped with the air brake.

A little below that it reads, "In making a service stop, always release the brakes a short distance before coming to a dead stop, except on heavy grades, to prevent shocks at the instant of stopping. Even on moderate grades it is best to do this." Suppose this is a long, partially equipped freight train and the hand brakes are also applied; if you release the brakes before you come to a stop, you will break the train in two every time. On pages 11 and 12, in regard to draining, the recommendation is that the main reservoir must be drained of any accumulated water after each trip, and the drain cup in train pipe under the tender frequently. Now, I would like to see that changed so that it would read, "that the train pipe must always be blown out thoroughly before connecting up the train." When the tank stops in the roundhouse the dirt all collects there, and when the men neglect to blow their train pipe out before they connect, all this dirt goes into the baggage car.

The Rogers Locomotive Works, of Paterson, N. J., have recently delivered to the Burlington & Missouri River road two decapod locomotives, part of an order now being filled. The engines are for use on the lines to the Black Hills. They have 22 × 28-inch cylinders; diameter of boiler shell, 70 inches; firebox, 9 feet 10 inches × 44 inches. Each engine weighs (light) 96 tons and 108 tons in working order.

Locomotive Crosshead.

The accompanying illustration, for which we are indebted to the *American Machinist*, represents a new design of a locomotive crosshead for which a patent has recently been granted to Mr. W. S. Hughes, of 237 East Seventy-third street, New York. It is made in two pieces; the joint is at *A B*; the parts are bolted together by the bolts *D D*, which also firmly clamp the piston rod to the crosshead. This end of the piston rod is tapered from each end of the hub toward the center, the smallest diameter being at the center. In order to obtain further security, two collars are formed on this end; the shoulders of these collars are not turned square to the axis; they are turned slanting, so that in tightening up the bolts *D D* all possible end play will be prevented. These collars are also admirably adapted for resisting the end thrust without throwing any extra strain on the crosshead or bolts *D D*. It will be noticed that no key is used for securing piston road to crosshead; therefore this end is much stronger than that of the ordinary design, and all danger of injury to the crosshead by driving a key is avoided. The piston rod has no shoulder bearing against the hub of crosshead, and therefore the liability of breaking the rod is much reduced. The taper on the end of the rod extends a little beyond the hub, which allows the rod to be trued up without reducing its diameter to such an extent as to make it smaller than that of the end. It must be readily perceived that a wrought-iron crosshead of this design can be made much cheaper than a solid one of the same form and material, and, on the whole, it is much stronger. Brass liners can readily be introduced between the wings and the slides, and held in position by the bolts *C C*, so as to prevent heating and cutting on the sides of the slides.



Some of these crossheads have been in constant use for several months, and have worked very satisfactorily; a further and more extended use will undoubtedly increase the appreciation of its good features.

Mr. E. B. Smith, general foreman of the car shops of the Utah Division of the Union Pacific, has been transferred to an Eastern shop. Mr. Smith was some years foreman of the car shops of the Burlington, Cedar Rapids & Northern, at Cedar Rapids, Ia.

The Canada Atlantic has just put in service two-day passenger trains which are said to be the finest ever placed upon a Canadian road. The first-class cars are framed of British Columbia fir and Southern pine, the exterior is finished in Canadian cherry, and the framework is polished and varnised to show the natural beauty of the material, with ornamentation of gold stenciling. The car is 57 feet long inside, and 63 feet over all. The internal arrangement is entirely different from any other car running in Canada. One new feature is a separate smoking-room seating eight people. The seats are covered with dark green leather. A swing door, additional to the ordinary door of the smooking-room, prevents the possibility of moke finding its way into the body of the car. One end of the car is provided with a neat washroom for men, fitted similar to those of the Pullman cars, and at the other end is a dressing-room for ladies, entirely cut off from other toilet arrangements. The seats are of the new Forney pattern. The wheels are of wrought iron with Krupp steel tires.

A French inventor has devised an instrument which he calls a sciséophone, intended to detect internal flaws in metal. The apparatus consists of a small pneumatic tapper worked by the hand, with which the piece of steel or iron is tapped all over. Connected with the tapper is a telephone with a microphone interposed in the circuit. Two operators are required, one to apply the tapper and the other to listen through the telephone to the sounds produced. These operators, who are in electrical communication, are in separate apartments, so that the direct sounds of the taps may not disturb the listener, whose province it is to detect flaws. In applying the system, one operator places the telephone to his ear, and so long as the sounds produced are normal he does nothing. Directly a false sound—which is very distinct from the normal sound—is heard, he instantly signals for the spot to be marked. By this means he is able not only to detect a flaw, but to localize it. A variety of practical tests have been made with the apparatus, and it worked so well that the scisoèphone promises to soon become a useful aid in testing the soundness of metals.

Most Economical Point of Cut-off.

A well-known French engineer has contributed to the British Institution of Engineers a paper giving particulars of experiments made on a French railroad to determine the conditions under which locomotives can be worked more economically. The conclusions agree very closely with those reached by Prof. P. H. Dudley and other investigators in this country. A great variety of speeds and diverse conditions of working steam were experimented with, and it was demonstrated that the most economical results were obtained for the steam used when the cut-off took place at 20 per cent. of the stroke with speed ranging from 22 to 30 miles an hour. When the speed was much reduced or increased away from the neighborhood o 26 miles an hour, loss of useful effort resulted. If a locomotive could always be run with a piston speed of 650 feet per minute, and cutting off at 20 per cent. of the stroke, it was concluded that only about 10 per cent. of saving would be possible were the engine changed to compound. Working at the most economical point, the consumption of steam was about 24 pounds per effective horse power. Trials were made to ascertain the maximum effective force that could be attained, that is the method of working the engine that would develop the greatest power. This was found to be with 70 per cent. of steam admission and running at about 22 miles an hour. A power within 12 per cent. of the theoretical figures was developed at the rails.

The lesson of these experiments is that if fuel saving were the supreme consideration in working our locomotives the master mechanics would best perform their duties by arranging that their locomotives should be run as much as possible, cutting off steam at about 5 inches and keeping up a piston speed of about 600 feet per minute. Anything like an approach to this practice is impossible on American railroads, but it is edifying for our people to learn additional facts about a subject which has excited a great deal of investigation and conflict of opinion, and what might be regarded as reliable authority.

Use the Driving-Wheel Lathe.

The different railroad clubs have lately directed attention to the uneven wear of driving-wheel tires, due to the irregular forces that actuate the wheel. Information on this subject is very desirable and seasonable. Since the Ross-Meehan driving-wheel brakeshoe became popular an impression has become common that driving-wheel tires may be run indefinitely without turning when the action of the shoe prevents the tire forming an outside flange. The use of a brakeshoe that maintains the tread of the tire uniform and keeps it up to the original section is one of the most important expense-saving devices ever put into service, but still there is a limit to its usefulness. The tendency of a driving-wheel tire is to wear out of round, and the kind of brakeshoe employed has little or no influence in retarding the progress of distortion. The only remedy is the driving-wheel lathe. It is well that this fact should be borne in mind, for the running of locomotives with tires out of round is an expensive and dangerous practice. As the driving wheels are all bound together by the siderods, distortion of the wheels away from a true circle shows tremendous strains upon the rods and crank pins, increasing the danger of breakage and greatly increasing the frictional resistance of the engine. When the wheels of a locomotive are of exactly the same size and the rod connections are made of pins properly set and true, the resistance offered by the machinery is very small. As the wheels become out of shape, the journals become oval and the crank pins get sprung or wear out of true, the engine has to expend an increasing power upon moving itself, and a period arrives with a locomotive badly run down when a serious amount of the power developed is wasted on moving the machine itself. For this reason it does not pay to permit a locomotive to get run down badly, even although the apparent need of repairs does not seem to be very great.

Exhibits at the Master Car Builders' and Master Mechanics' Conventions.

The following is a list of those making displays in "Exhibition Hall," with their exhibits:

American Steel Wheel Co., New York. Full-size 30-in. engine truck, spoke and solid double-plate wheels; 33-in. engine-truck wheel; 36-in car wheel; 42-in. driving wheel, elevated railroad pattern. Steel knuckles, with shavings from same, showing uniformity of material without blowholes.

Ashcroft Manufacturing Company, 111 Liberty street, New York. Tabor indicator, locomotive improved steam gauge.

F. W. Bird & Son, East Walpole, Mass. Sample of "Neponsett" car roofing.

Boyden Brake Company, Baltimore, Md. Full size locomotive brake; six freight brakes in operation, one being Westinghouse; piping for 10 pneumatic signals, air-pumps in operation, air-brake governor, quick-action triple valve, engineer's valve.

Boyer Railway Speed Recorder Company, Chicago, Ill. Speed recorder.

Brown Automatic Car Coupler Company, Denver, Col.

Buckeye Coupler Company, Columbus, O. M. C. B. automatic coupler.

Butler Drawbar Attachment Company, Cleveland, O.

Bundy Manufacturing Company, Binghamton, N. Y. Automatic time recorder.

Car Truck Supply Company, Chicago, Ill. Oil box lids and side bearings.

Chalmers, Spence Company, 59 Liberty street, New York. Asbestos pipe coverings.

Chicago Grain Door Company, Chicago, Ill. Car door.

Consolidated Car Heating Company, Albany, N. Y. Working model in glass of coil drum, disc, drum, commingler and commingler storage systems, automatic temperature regulator, fittings, couplers, hose connections, gauges, charts.

Consolidated Safety Valve Company, 111 Liberty street, New York. Locomotive safety valve mufflers.

Crosby Steam Gage & Valve Company, Boston, Mass. Indicators, steam gauges, vacuum gauge, clocks, chimes, whistles, phosphor tin, gauge-testing apparatus, mufflers, Johnstone blow-off valves and cylinder cocks.

Cross Planer Knife Company, Cleveland, O. Planer knife.

Curley & Bailey, Troy, N. Y. Metallic steam hose coupling.

Cushion Car Wheel Company, Indianapolis, Ind. Car wheels.

Damascus Bronze Company, Pittsburgh, Pa. Samples, car brasses and strap brasses.

Davis Spring Plate Company, Wilmington, Del. Freight bolster spring plates of pressed steel. Car springs.

De Roberts & Alexander, Omaha, Neb. Link and pin coupler.

Des Moines Patent Promoting and Manufacturing Company, Des Moines, Ia. Edey automatic ball coupler.

Detroit Lubricator Company, Detroit, Mich. Cylinder and triple lubricators, Garfield automatic injector.

Dickey Automatic Car Coupler Company, Des Moines, Ia.

Drake & Wiers, Cleveland, O. Car roofs.

Drekel Car Coupler Company, Chicago, Ill. Drexel car coupler.

Drexel Manufacturing Company, New York. Axle grease.

Dudgeon, R., New York. Hydraulic punches, jacks, crank pin press and boiler tube expanders.

Eells & Morrison, Cleveland, O. Car coupler.

Erie Car Heating Company, Erie, Pa. Steam pipe connections, car heating connections.

Eureka Coupler and Buffer Company, of Minneapolis, Minn.

Ewald Iron Company, St. Louis, Mo. Staybolt iron.

Fairbanks & Co., New York. Valves.

Falls Hollow Staybolt Company, Cuyahoga Falls, O. Mandrel rolled hollow staybolt iron.

Ferracute Machine Co., Bridgeton, N. J. Sheet-metal tools.

Field Feed Water Purifier Company, 134 Van Buren street. Chicago, Ill.

Ford, Whitworth Company, Newark, N. J. Car coupler link and pin type.

Fox Solid Pressed Steel Company, 115 Broadway, New York. Pressed truck, engine front, center plates, cylinder head casing.

Garrett's Hydraulic Motor Company, Union, S. C. Hydraulic pump.

Gold Car Heating Company, Bridge Store No. 6, New York, 652 Rookery, Chicago, Ill. Steam heating appliances showing practical working with steam; two cars equipped at depot.

Gould Coupler Company, New York. Car coupler.

John B. Goodwin, 29 Broadway, New York. Full-size model of the Wood platform car gate.

Graves Car Coupler, Cedar Rapids, Ia.

Hale & Kilburn, Philadelphia, Pa. Car seats.

Hall, C. F. & Son, Skaneateles, N. Y. Plug cock and valve repairers.

Harless Flush Car Door, Anniston, Ala. Full-sized model of car door, showing closed and grated door.

Hartford Woven Wire Mattress Company, Hartford, Conn. Roberts car seats, wire mats.

Hinson Coupler Company, 518 Rookery, Chicago, Ill.

Hunt, C.W. & Company, New York. Coal conveyor.

Hutchins & Sons, Detroit, Mich. Freight car roof, card holder, grain door, spike.

International Car Company, Albany, N. Y. Car coupler.

Jenkins Bros., New York, valves.

Johns, H. W., Mfg. Co., New York. Asbestos and vulcabeston.

E. N. Jones, St. John, N. B. Jones automatic coupler.

Keegan & Haplin, 44 Washington street, New York. Wells light.

L. B Kenney Car Coupler Company, Dansville, N. Y. Car coupler.

Knitted Mattress Co., Canton, Mass. Patented textile fabrics, quilted by a knitted process of stuffing car seats and backs, to take the place of curled hair. Also table-padding, stair padding and mattresses of the same material.

Lappin Brakeshoe Company, 45 Broadway, New York. Brake shoes.

H. L. Leach, Boston, Mass. Sand-feeding apparatus for locomotives.

Litofuge Manufacturing Company, New York. Boiler compounds.

McConway & Torley, Pittsburgh, Pa. M. C. B. Standard coupler.

Manning, Maxwell & Moore, 111 Liberty Street, New York. Pond Machine Tool Company. Photographs of machine tool.

Martin Anti-Fire Car Heater Company, Dunkirk, N. Y. Hose coupler, thermostat.

Mason Regulator Co., Boston. Air-brake regulators, reducing valves for car heating and pressure regulators.

Mather Wedge Lock Car Coupler Company, 175 Fifth Avenue, Chicago, Ill. Car coupler.

McLeod Car Heating & Ventilating Company, New York. Fittings and blue prints of car heating and ventilating.

Michigan Railway Supply Company, Detroit, Mich. Brakebeams, steel door on car.

Moore Car Door Company, Chicago, Ill. Car door.

Moran Flexible Steam Joint Company, Louisville, Ky. Flexible steam joint.

Morton Safety Heating Company, Baltimore, Md. Equipment for heating cars.

National Car Spring Company, New York. Locomotive driver spring.

National Electric Headlight Company, Indianapolis, Ind. Pyle electric headlight.

National Hollow Brakebeam Company, Chicago, Ill. Hollow brakebeam.

National Lock Washer Company, Newark, N. J. Nut locks.

Neponset Roofing Company. Car roof.

New York Car Wheel Works, Buffalo, N. Y. Car wheel.

Norton, A. O., 45 Oliver Street, Boston. Railway and bridge jacks.

Norwood Car Replacer Company, Baltimore, Md. Car replacers, model cattle guard.

Page Belting Company, 16 Dey Street, New York. Round and flat belting, lacing and graphite metal.

Page, Newell & Co., Boston, Mass. Brunswick steel-tired wheel; exhibit of model and blue print.

R. M. Pancoast, Camden, N. J. Samples of car ventilators.

Peerless Rubber Company, 15 Warren Street, New York. Air brake rubber hose packing, vestibule diaphragms, rubber mats.

Pencoyd Iron Works, 261 South Fourth street, Philadelphia, Pa. Car axles.

Phillips, W. H., Jenkintown, Pa. Model of rail-bender, rear of train protector.

The Railroad Lighting & Manufacturing Co., Philadelphia, Pa. A special train composed of a Pullman sleeping car, a cnair car and passenger car lighted by the Frost Dry Carbureter system.

Richardson's Automatic Car Coupler Company, Lake Village, N. H.

Riehle Bros. Testing Machine Company, Philadelphia, Pa. Robie's patent screw jack.

Roberts Manufacturing Company, Columbus, O. Pipe coupling, model of car heating system.

Ross Valve Company, Troy, N. Y. Reducing valve.

Safety Car Heating and Lighting Company, 160 Broadway, New York. Full size model steam regulating valve. Gibbs coupler, hose connections, cocks.

Sanford Mills Car Plushes, L. C. Chase & Co., Boston, selling agents. Samples plain and frieze plushes.

Scarritt Furniture Co., St. Louis, Mo. Car seats.

Schoen Manufacturing Co., Pittsburgh, Pa. Pressed steel car fittings, center plates, stake pockets, brakebeams.

Schutler Manufacturing Co., Chicago, Ill. Ratchet drill.

Schutte & Co., L., Philadelphia, Pa. Korting injectors, syphon pumps, exhaust steam induction condenser, Watson & Miller steam trap, hydraulic valve, steam turn-table motor, globe and check valves.

Smillie Coupler and Manufacturing Co., Newark, N. J. M. C. B. Standard coupler.

Springer Automatic Coupler Co., Des Moines, Ia. Automatic couplers.

Standard Car Coupling Company, Troy, N. Y. Dowling improved coupler.

Thurmond Car Coupling Company, 80 Broadway, New York. M. C. B. standard coupler applied to Miller buffer and lever.

Tilden & Co., B. E., Cleveland, O. Car replacer.

Topping & Fox, 96 Chambers Street, New York. Metallic piston-rod packing.

Trojan Car Coupler Company, Troy, N. Y. Full-sized M. C. B. Standard coupler.

Union Coupler Co., Philadelphia, Pa. A full-sized M. C. B. coupler.

United Railway Supplies Company, 97 Water Street, New York. Robert Eastwick coupler.

United States Metallic Packing Company, Philadelphia, Pa. Metallic piston-rod packing.

Universal Brake beam Company, Chicago, Ill. Brakebeam.

Van Dorston, A. W., Washington, D. C. Cushioned carrier iron.

Van Dorston Cushioned Car Coupling Equipment Company, 305 Walnut street, Philadelphia, Pa. Car couplers.

Wakefield Rattan Company, Boston, Mass. Henry's patent high-back tilting car seat in plush and low-back seat in rattan.

Watson & Stillman, New York. Broad-base shop jack, new journal-box jack for passenger coach, blue prints of Vreeland transfer jack, also improved wheel press and crank-pin press.

Weeks' Automatic Car Coupler Company, Rondout, N. Y. Car coupler.

Welsh Mountain Mining Company, Philadelphia, Pa. Fire sand and clay.

Westinghouse Air Brake Company, Pittsburgh, Pa. Model of locomotive driver brake.

H. A. Wheeler, Chicago, Ill. Car seats.

Williams, Dyer, Cedar Rapids, Ia. Car coupler.

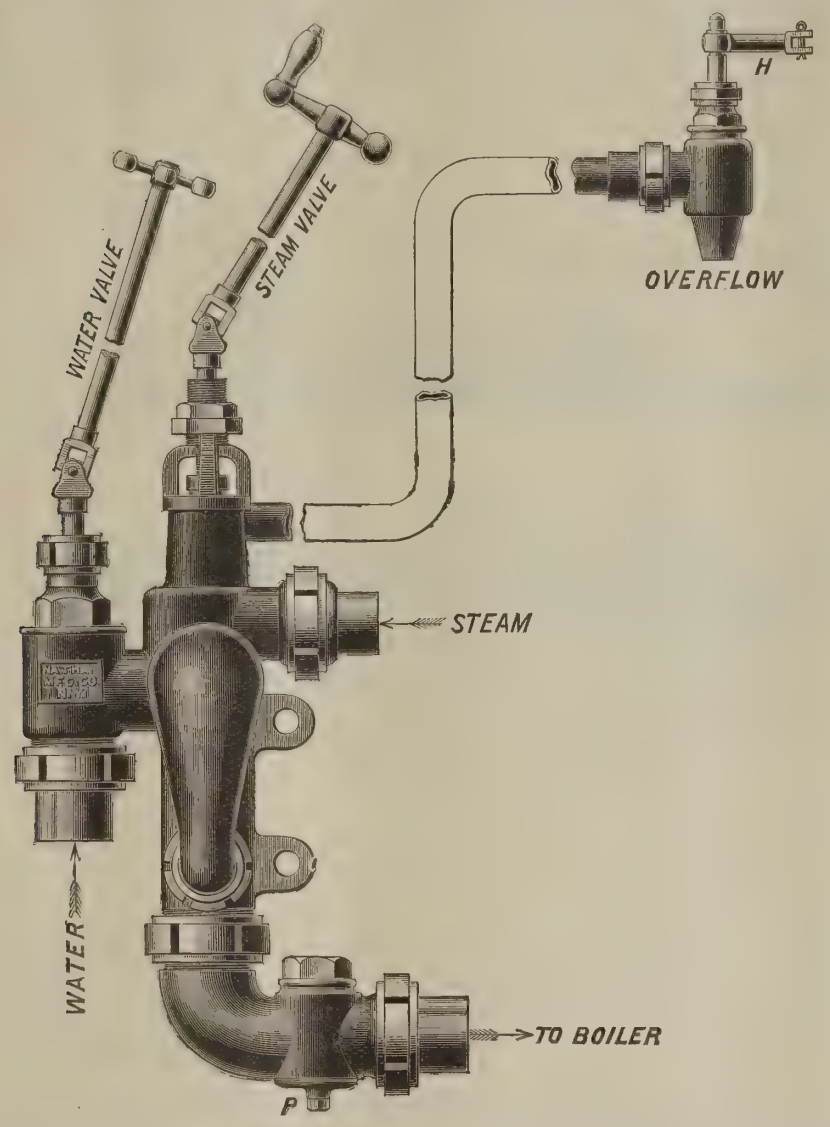
After a long litigation in the Patent Office, occupying over three years, a decision has just been rendered in favor of W. C. Baker as the first inventor of the combination with a car "of a system of circulating pipes within said car, and two heaters both in operative contact with said circulating system, or with branches thereof, and adapted to be operated simultaneously or separately for imparting heat thereto."

The Hale & Kilburn celebrated patent spring edge seats and backs are to be used in the 99 cars being built for the Chicago & Northwestern Railroad by Pullman's Palace Car Company, and a large portion of the order has already been delivered. The Hale & Kilburn spring edge seat is the standard of the Pullman company for all their sleeping cars, as is also their patent reversible seat for the Pullman day coaches.

New Nathan Injector.

On one of the passenger locomotives belonging to the New York Central is to be seen a novel form of non-lifting injector of the form illustrated in the annexed engraving. It appears to combine the advantages of the lifting and non-lifting injectors both. The purpose of the improvement as set forth by the inventors is to provide an injector simpler in operation and more reliable under adverse circumstances than those now used.

In non-lifting injectors as hitherto constructed the open-



ing of the overflow which is allowed to escape in the start has been placed, as well as the injector, below the lowest level of the water supply. This practice makes it necessary to close the water-regulating valve whenever the injector is stopped in order to prevent the loss of water which otherwise would result from the escape through the overflow opening. There is also considerable loss of water by this overflow every time it is operated before the injector can be adjusted. To remedy these acknowledged defects in a non-lifting injector, the changes shown have been made carrying up the overflow above the water level. A starting jet is employed and the injector is started and stopped in in the same way as a lifting injector. Besides preventing the loss of water, this arrangement enables the engineer to watch the working of the injector easily and he does not require to reach his head outside the cab to watch when the overflow is taken up. This injector is about to be put on the market by the Nathan Manufacturing Company, of New York.

The Pullman sash balance continues to make new friends wherever it is brought into use. Mr. F. Hufsmith, master mechanic of the International & Great Northern, recently wrote saying that the balance sashes he had in use were satisfactory in every respect.

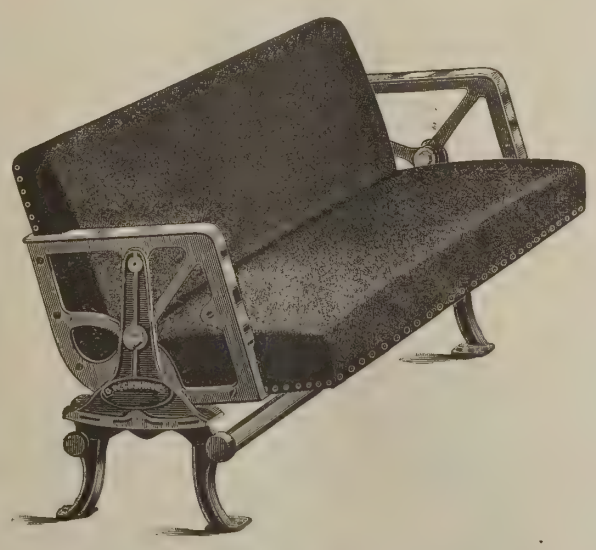
One of our contemporaries lately infused unusual interest into its reading pages by publishing a long article on "the application of the differential calculus to the determination of frog angles." It was awfully interesting—comparatively.

The subject of purification of feed water is an old one with the Master Mechanics' Association, and several excellent reports have been made upon it. Here is an extract from a speech made by Mr. H. A. Towne, after the reading of a report on water purification in 1874, that applies very well to the situation to-day: "Boiler compounds are no doubt meritorious; but will they remove the difficulty? The business of this committee is to submit to this convention a feasible, plausible remedy, something we know will produce the desired results. You may recommend boiler compounds for the removal of scale, and it might be adopted by this convention; but in two years we would be running right in the old channel that we now are in; we would have just the same difficulties to contend with as we have at present. As soon as the excitement in favor of making the best of the compound subsided men would get careless, and no benefits would be obtained. There is no use introducing a thing unless it is going to be followed up. Tannate of soda may prevent the formation of scale, but it must be looked after."

The New York Safety Car Heating and Lighting Company have received letters from a great many prominent railroad men testifying their belief in the Gibbs coupler for connecting car-heating pipes. The Pullman Palace Car Company are equipping a great many of their cars with this coupler. Mr. J. S. Merrill, superintendent of that company, after mentioning a number of lines where they have had the coupler in use, says: "The simplicity of its construction and the ease with which it may be coupled or uncoupled, on the same principle as the Westinghouse air-brake coupler, especially commends it to trainmen. I have also to say that I have taken pains to inquire of railroad mechanics generally with regard to this coupler, and have heard none but the most favorable opinions expressed."

Cushings Car Seat.

The car seat illustrated is a novel design the object of which is to provide a seat which shall embody all the substantial advantages of those of the ordinary reversible type, with a material economization of cost and simplification of structure related thereto. The seat and back are held by and secured to the angular reversible end frames, which serve as seat arms, and which are pivoted to the end supports, and being reversed in position on their pivoted centers are alter-



nately used as seats and backs. Any degree of angle desired may be given to the seat and back in construction of same. A desirable feature of this design appears in its economy of space, and the fact that seats will not be used facing each other, thus insuring that one person shall not occupy more than one seat, and that a lady may be assigned one entire seat without being subject to intrusion by a reversal of opposite seat and its use by undesirable presence.

The new seat is designed by G. W. Cushing, of Chicago, who has recently patented several novel seat frames, the present one being the result of an effort to produce a cheap seat wherever desired in place of the more expensive and ordinary form of car seat. It is placed on the market in plush or rattan by the H. A. Wheeler Car Seat Co., of Chicago.

The Drexel Coupler.

A great many railroad men and others who have studied the matter carefully believe that ultimately the best and most successful designs of Master Car Builders' couplers will be so arranged that the knuckle can be swung open from the side of the car, thus doing away entirely with the necessity of men going between the cars for the purpose of doing anything in connection with the coupling of cars. Those who entertain this belief will be especially interested in the coupler which we show in the accompanying illustrations. It is known as the Drexel coupler, and is being placed on the market by the Drexel Car Coupler Company, of Chicago. Fig. 1 is a prospective view taken in such a position as to show that portion of the unlocking mechanism which throws the knuckle open from the side of the car, and Fig. 2 shows a perspective taken from another position, the knuckle being wide open, expos-

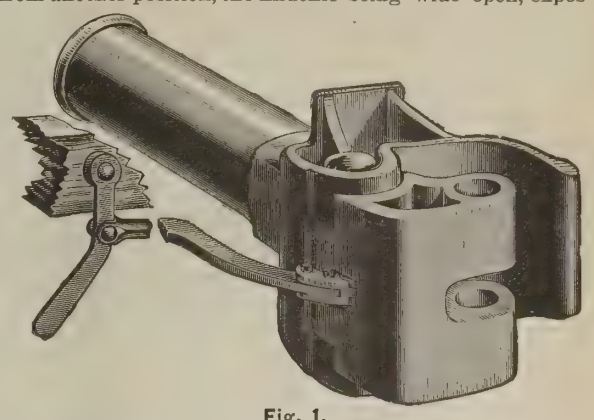


Fig. 1.

ing a portion of the lock, the remainder being shown in dotted lines. The coupler conforms strictly to the M. C. B. lines, there being no deviation from them in any particular.

It will be seen that the fulcrum pin is located somewhat farther back than is the case with some of the more familiar patterns, but in designing the coupler the effects of such proportion was very carefully studied and, as a result, the coupling action obtained is very smooth. This position of the fulcrum pin strengthens both the knuckle and the head. The knuckle is benefited because it has the direct buffing action against the faces of the ears on the head, and there is more metal between the back of the link slot and the fulcrum pin hole. This has the effect of greatly strengthening the lugs of the knuckle, and everyone familiar with the subject knows this is an important subject. The proportions of the head are better because the ears do not project so far from the remainder of the head and are therefore stronger. The buffing strains are taken on the face of these ears and also on a projection cast on the inside of the head, which

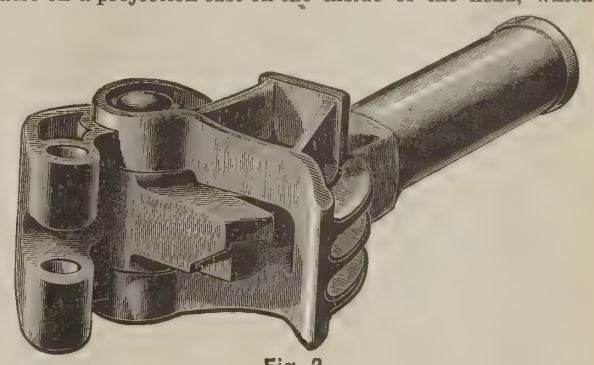


Fig. 2.

prevents the knuckle from rotating inward. The strains are very well met in this and in other respects the lock is located within the locking arm. As will be seen from Fig. 2 it consists of a block scooped into a seat at one end and rotating about it as a fulcrum. When the knuckle is closed the lock drops by gravity, and engages the face of a stop cast in a suitable position on the inside of the head. The locking arm is of good length, thus reducing materially the strain on the lock and causing the stop for the latter to be located over on the guard arm side of the head. This is a good position for the lock, as the slight amount of wear which must inevitably take place at this point is nearly neutralized by the wear at the fulcrum, so that there is very little rotation of the lock knuckle from its normal position, which is due to wear, and a given amount of wear will therefore cause a very light opening of this knuckle and a minimum departure from the lines. The lock is raised by a link connection, which passes out of the knuckle just forward of the fulcrum pin, as shown in Fig. 1. This is connected by a suitable mechanism to a lever at the corner of the car by which the lock is raised.

The knuckle is thrown open from the side of the car by means of this unlocking device, no additional gear of any kind being necessary. When the lever at the corner of the car is lifted it first raises the lock, but it is evident if the lever is pulled still further there is a tendency to rotate the knuckle into an open position, because the connection to the lock passes into the knuckle a little ahead of the fulcrum pin. This has been placed just far enough ahead to accomplish this purpose, and a most positive knuckle-opening device is the result. It is impossible that the knuckle should be struck so hard by any ordinary cause as to prevent this opening device from moving.

The coupler is made of the best grade of metal; malleable iron is used for the head, and the best of steel for the knuckle. The lock is of malleable iron, the fulcrum pin of steel, and such proportions are used as will insure great strength. The offices of the Drexel Car Coupler Company are at 219 La Salle street, Rookery Building, Chicago, Ill.

Stanley G. Flagg & Co., Philadelphia, direct attention to the popularity of their steel fittings for railroad rolling stock. The Westinghouse Air Brake Company and numerous railroad companies use these fittings exclusively.

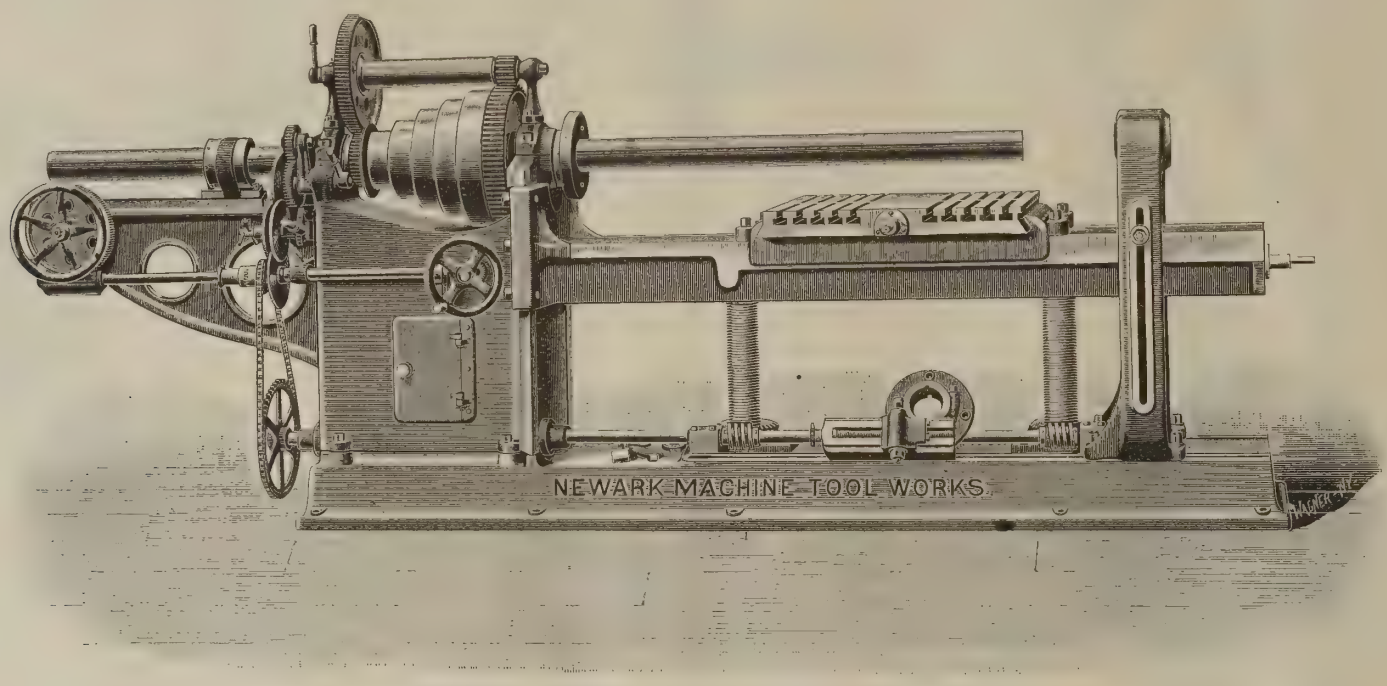
Horizontal Boring and Drilling Machines.

The cut annexed shows one of the larger sizes of horizontal boring machines which are being built by the Newark Machine Tool Works, Newark. N. J. A few months since we illustrated their C or 3-in. bar machine. The makers call this the E or 5-in. bar machine. It has been the custom heretofore to grade the class of machine tools by the swing, but the Newark Machine Tool Works claim that the diameter of the boring bar is the only correct measure of the size of the tool, for this limits its greatest cylinder boring capacity.

The cut shows a table 9 ft. in length, but shorter tables are furnished and the swing also may be increased if desired. This machine has the same features and style shown in the design of the smaller tool. The feed can be varied from 1-80 to ¼ without stopping the machine; the bar can be gripped at any point and it can be fed backwards or forwards without re-setting the cutters. There is also a quick and slow hand motion for the bar.

The power lift for the table is a feature peculiar to the larger machines. It will be noticed that the lower ends of the table-lifting screws are carried by worm gears threaded to serve as nuts. These gears take their motion from the worm shaft, which is driven from the feed shaft by means of the chain gearing. In this way the power from the driving cone is used to lift the table, and this arrangement enables the workman to move the table without leaving his position, and when the work is nearly set he can throw the power lift out of gear, and make the delicate final adjustment by hand, using the slow-feed hand wheel.

Other points of excellence are the strong forms of table and yoke. The table is not cut in two to receive the feed screw for the saddle, and this construction permits a system of cross bracing underneath. These features add materially to the stiffness of the machine.



NEWARK BORING AND DRILLING MACHINES.

The Elmore Car Axle Box Lid Company desire to say to master car builders and superintendents of motive power of railroads that they are now prepared to furnish them the Elmer journal box lid, made in pressed steel at a weight of two pounds per lid.

The National Lock Washer Company, Newark, have recently been compelled by the great increase of business to find more extensive quarters. They have built a new factory on Johnson and Hermon streets which has a capacity of 100,000 lock washers a day. They moved into the new building a month ago.

We have received a copy of the Metal Trades Directory for New England and New York, published by Price Lee & Co., Hartford, Conn. It has been compiled with great care, and is an exceptionally good work of reference for firms doing business within the great range of interests comprised in the metal trades.

The Norton improved lifting jacks have jumped suddenly into great favor with railroad men. This jack has a screw which is operated with a ratchet lever having an up-and-down motion like that of a hydraulic jack. The device combines the three powers—the lever, screw and gear. We expect to illustrate it in an early issue.

The Crosby Steam Gauge and Valve Company, of Boston, is represented by Edward C. Bates, who has charge of their railroad business. They made at the convention a very fine exhibit in the line of steam gauges, pop and muffler safety valves, chime whistles (which are being adopted on the passenger service of many of the large roads), steam-engine indicators, improved gauge testing apparatus, etc.; also specimens of phosphor tin, which is attracting great attention among master mechanics and foundrymen using compositions, as a small percentage of this phosphor tin added to a charge of metal greatly facilitates its manipulation, at the same time hardening and toughening the metal without making it brittle. Attention is also called to the Johnstone blow-off valve and cylinder cocks manufactured by this company, which have been in use on the Mexican Central Railroad and elsewhere for several years, giving entire satisfaction. These valves and cocks are receiving many commendations from the master mechanics who have seen them.

Consolidated Car Heating Company's Election.

The annual meeting of the stockholders of the Consolidated Car Heating Company was held at Albany, June 2, and Hon. William C. Maybury, Detroit, Francis A. Smith, Portland, and George R. Meneely, Albany, were appointed by the directors a committee to conduct the election, which resulted in the choice of the following board of directors: Robert C. Pruyn, Albany; George Westinghouse, Jr., Pittsburgh; George M. Gray, Chicago; William C. Rice, Albany; Albion Little, Portland; James F. McElroy, Albany; J. H. Sewall, Chicago; A. S. Hatch, New York; A. N. Brady, Albany; George L. Walker, Detroit; D. D. Sewall, New York; Charles J. Peabody, Albany; H. S. Osgood, Portland; R. C. Blackall, Albany; Caleb H. Jackson, New York.

The affairs of the company were reported in excellent condition and with a considerably increased business as indicated for the next year.

At a meeting of the board of directors the following officers were chosen for the ensuing year: Robert C. Pruyn, president; William C. Rice, vice-president and treasurer; D. D. Sewall, general manager; James F. McElroy, mechanical superintendent; J. H. Sewall, assistant general manager; Charles J. Peabody, secretary.

An executive committee was selected to consist of Messrs. Robert C. Pruyn, William C. Rice, George Westinghouse Jr., D. D. Sewall, James F. McElroy and A. S. Hatch.

The Chicago, Milwaukee & St. Paul use a tender for generating the steam and light used on their passenger trains. At first they tried ordinary steam engines for driving the dynamos, but the vibration proved objectionable. It was overcome by putting in Westinghouse engines.

The Cushion Car Wheel.

The annexed engravings illustrate a form of car wheel possessing several features that promise to make the wheel popular with railroad men. The special claims made for the "cushioned wheel" are simplicity of form, elasticity, durability, safety and economy in repairing and renewing tires. The wheel is composed of only two main parts, the center and the tire.

Referring to the sectional view of the wheel, the figures indicate the parts as follows: 1. Cast steel or iron center. 2. Rolled tire. 3. Rubber cushions. 4. A shield of sheet steel or iron, No. 20 gauge. 5. Safety guards on center. 6. Inwardly projecting flange. 7. Flanges on wheel center. 8. Bolts or rivets. 9. Holes in flanges on tire. 10. Holes in center for bolts or rivets.

The center is a strong steel casting combining strength and lightness as well as they can be balanced.

The tire is of regular standard form at the tread, is provided with an inwardly projecting annular flange, formed on the outer face for the purpose of not only securing the tire to the wheel center, but also for receiving and counteracting the end thrust of the wheel center when flange of tire strikes the rail. There is also a peripheral lip formed on the wheel center at its inner face, over which a portion of the end thrust is distributed, thus relieving the flange of some of its working stress.

The cushion is of dense combination rubber that is perfectly protected by the center and tire. The wheel is made by the Cushion Car Wheel Company, Indianapolis, Ind.

The Ferracute Machine Company, of Bridgeton, N. J., manufacture a full line of presses, dies and other machinery for bar and sheet metals. They make a specialty of all kinds of sheet-metal machinery such as is used by the car and locomotive builders, railroad shops, etc. Their lighter lines of presses are for manufacturing lanterns, lamps, railroad tinware, and a great variety of other articles in tin, sheet iron and brass, etc. They make also a heavier line of punching and shearing presses for bar and thick metals, and some very large and heavy presses for bridge and building work, also a special line of shearing and punching machinery. They will send on application a handsome illustrated price list describing their goods.

Our Directory.

Adirondack & St. Lawrence.—Jas. Macbeth has been appointed superintendent of motive power and rolling stock.

Atlantic & Danville.—C. W. Murdaugh has been appointed purchasing agent.

Central Vermont.—J. W. Hobart, general manager, has resigned.

Chicago, Rock Island & Pacific.—C. F. Wilson has been appointed superintendent of motive power, vice B. K. Verbryck, deceased. J. Black has been appointed master mechanic Illinois Division, with office at Chicago, Ill.

Cleveland, Akron & Columbus.—Jas. Harrington has been appointed general superintendent. J. Hurry has been appointed superintendent, vice R. G. Sharpe, resigned.

Cleveland, Cincinnati, Chicago & St. Louis.—Jas. Ramsey, Jr., has been appointed general manager, vice W. M. Green, resigned.

Cornwall & Lebanon.—N. Irish, general superintendent, has resigned.

East Tennessee, Virginia & Georgia.—W. H. Hudson has been appointed master mechanic of the Atlanta and Brunswick divisions, vice E. M. Roberts, resigned. W. A. Stone has been appointed master mechanic of Alabama Division, vice C. L. Petriken, resigned.

Louisville, Evansville & St. Louis.—George E. Evans, general manager, has resigned.

Lynchburg & Durham.—Wm. M. Mitchell, general superintendent, hasresigned.

Michigan Central.—J. R. Dutton has been appointed purchasing agent, with headquarters at Detroit, Mich.

Mont Alto.—J. F. Boyd has been appointed superintendent, vice G. D. Wirstling, resigned.

New York, Lake Erie & Western.—C. R. Fitch has been appointed superintendent of Eastern Division.

Pittsburgh, Shenango & Lake Erie.—J. T. Blair has been appointed general manager.

Pittsburgh & Western.—R. B. Reynolds has been appointed superintendent of the Northern Division, with headquarters at Foxburg, Pa.

Richmond & Danville.—V. E. McBee has been appointed superintendent of Central of Georgia, now operated by Richmond & Danville.

Seattle, Lake Shore & Eastern.—G. W. Dickinson has been appointed superintendent, vice F. W. Dunn, resigned.

South Carolina.—E. M. Roberts has been appointed master of machinery, vice J. H. Agnew, promoted.

West Shore.—Mr. Garrison has been appointed master mechanic with office at East Buffalo, N. Y.

Western of Alabama.—W. M. Apps, master car builder, has resigned.

NATIONAL CAR AND LOCOMOTIVE BUILDER

AUGUST, 1891.

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The New England shops are busy on repairs and new work.

The Merchants' Dispatch is reported to be in the market for 1,500 cars.

A glass brakeshoe is one of the latest inventions protected by letters patent.

The Southern Pacific have received two fine chair cars from Pullman, finished in bird's-eye maple.

Harlan & Hollingsworth are building a handsome private car for President Miller, of the N. Y., P. & B.

Kansas City, Fort Scott & Memphis have let 500 freight to the Litchfield Car Co.; 100 of them are furniture cars.

The Rogers Locomotive Works have received an order from the Illinois Central for 22 consolidation locomotives.

The Ohio Wheel and Foundry Company haf been incorporated at Toledo, O., where operations will be carried on.

The Fall Brook Coal Co. have let contracts for 500 cars, 200 box, to the Buffalo Car Co., and 300 coal to a New England car Co.

The Fitchburg is building 12 standard coaches; also at work on 300 freight cars; will build very soon 100 Eastman heater cars.

The most expensive street car in the world is owned by the Troy Electric Railway Car Company, of Cleveland. It cost $10,000.

On a card in a street car this great truth is heralded "Advertising is a great deal like making love to a widow—it can't be overdone."

The citizens of Beaumont, Tex., have guaranteed a bonus of $50,000 for the establishment of the proposed car works at that place, and building will begin at once.

Northern parties are investigating with a view of establishing in Fernandina, Fla., car wheel works, iron and brass foundry, marine railway and machine shops.

The Canadian Pacific Railway Company will erect a machine shop at Henderson, Me., for repairing the rolling stock of the road. An iron foundry is also contemplated.

A patent on a rotary engine or pump has lately been awarded to George Westinghouse, Jr. The inventing of a practical rotary engine has been a favorite hobby with Mr. Westinghouse for years.

The Rhode Island Locomotive Works have been given an order for 20 locomotives to the Toledo, St. Louis & Kansas City road. The same road has given the Michigan Car Company, of Detroit, an order for 500 box cars.

The extensive new car shops of the Philadelphia & Reading Railroad at Wayne Junction have been completed, after months of work, and are now in active operation. This plant will in time give employment to about 500 men. At present a force of some 75 mechanics is employed.

The Swett Car Wheel & Foundry Company has been organized at Saco, Me., for the purpose of manufacturing car wheels, etc. The company has a capital of $250,000, and its officers are: President, George W. Swett, of Troy, N. Y.; treasurer, Fred W. Swett, of Troy, N. Y.

The American Railway Master Mechanics' Association, formed for the advancement of knowledge concerning the principles, construction, repair and service of the rolling stock of railroads, filed a certificate of incorporation in the office of the Secretary of State in Albany, N. Y., on July 20.

The Roadmasters' Association of America will meet in convention at the West Hotel, Minneapolis, on Sept. 12. The business to be taken up is: Standard frogs, new joints, interlocking devices, position of guard rail at derailing switch, track jacks, track work, chemicals used in steel rails, laying rails.

The Erie people are running the Raub locomotive that was built at Paterson some years ago and has lain idle ever since. The engine has two return-flue boilers and upright cylinders that transmit the power through an independent driving shaft.

The Brooks Locomotive Works shipped last Saturday the first two locomotives of an order of nine to the Cincinnati, Hamilton & Dayton, and will send the other seven within a week. They are constructing a locomotive for the Standard Oil Company, and will shortly begin shipping ten locomotives for the Lake Shore.

After being idle several years, the rolling mill at Covington, Ky., formerly operated under the name of the Swift's Iron and Steel Works, has started up. The works have undergone a thorough overhauling, and extensive repairs have been made. The muck mill has been taken out and replaced with a sheet mill, this making three sheet mills in all. The blast furnace will not be operated.

The New York Central have received one of the three double-ended suburban engines ordered from Schenectady. The engines have six pairs of driving wheels connected, a pony truck in front and a six-wheel truck behind. The cylinders are 18x22 and the driving wheels are 60 inches diameter. The Schenectady works have lately delivered two heavy ten-wheel locomotives to the Southern Pacific.

The companies running sleeping cars in the State of New York are likely to be put to considerable annoyance by a change that was smuggled through the legislature a year ago prohibiting sleeping car companies from charging more than 80 cents a night for berths. The law did not go into effect till May last, and few people were aware of its existence till within the last month.

The St. Charles Car Works have taken a contract to build 250 cars for the Wabash, and they are being turned out at the rate of 15 cars per day. Among other companies that have placed orders at St. Charles within the month are the Iowa Central, 100 box cars; the Mexican National, 250 box cars, with the option for 500; the Choctaw Coal and Railway Company, 500 gondola cars. They are also building some very elegant sleeping cars for the Krehbiel Palace Car Company.

Word comes from Seattle that President Oakes, of the Northern Pacific, has promised that his road will transport the World's Fair exhibit of the State of Washington to Chicago free of charge. It is estimated that this is equivalent to adding $20,000 to the State appropriation. When Commissioner Meeker asked the railway president how large a piece of timber he could carry to Chicago, Mr. Oake replied: "Mr. Meeker, I will just say that you may scour this State over and find the biggest piece of timber in it, and we will carry it to Chicago if it takes ten cars."

A large casting weighing 90,000 pounds was recently shipped over the Pennsylvania Railroad Company's lines, consigned to the Cambria Iron Company at Johnstown. It was a half section of a fly wheel, and a special car was required for its transportation from Philadelphia. The car was borrowed from the Baldwin Locomotive Works, as the railroad company had no car with a capacity above 70,000 pounds. The wheel is in halves and finished ready for bolting together, and when completed will be 25 feet in diameter with a rim 18 inches thick and 28 inches wide.

An improvement on stock cars has been patented by Mr. John A. Stewart, Mansfield, O., which arranges a car with removable stanchions so constructed that separate compartments may be thereby conveniently and quickly formed in the car to accommodate one or more animals. Provision is also made for attending to the stock at any time, whether the car is in motion or not, and for the storage of a quantity of food, which may be placed in the storage compartment without disturbing the cattle, while a water trough is provided, adapted to be supplied from stationary reservoirs.

The Springfield (Mo.) Car & Foundry Company have got their new works in operation. The buildings are all brick, detached, and occupy the site of the old plant, which was completely destroyed—not a vestige of it remaining. The molding room, or foundry proper, is 72 by 176 feet, with an extension of 25 by 60 feet to serve as a chipping room. The machine shop is 50 by 100 feet, two stories; the blacksmith shop 25 by 50 feet, and engine room 20 by 16 feet. The pattern shop is a two-story structure, 35 by 60 feet, removed some distance from the other buildings. The office is 35 by 50 feet.

The Pike's Peak Railway, in Colorado, is now in operation, the first passenger train having gone to the summit on July 1. This railway offers a remarkable attraction to tourists in a railroad running from Manitou Springs, 6,400 feet above sea level, to the top of the mountain, 14,147 feet high, where a hotel has been constructed. The road is less than nine miles long and the cars are pushed up the track by a locomotive furnished with cog wheels, engaging with the teeth of a third rack. The mountain is to be illuminated by electric arc lights, so that trips may be made in the evening and visitors remain at the hotel to see the sunrise in the morning. The road is altogether exceptional as a mountain railway, for it starts at a height above sea level where some of the famous existing roads end, and carries the passenger to the highest inhabited point of the world.

The Muskegon Car Company, of Muskegon, Mich., which closed its works some three months ago, has been reorganized by the creditors, under the name of the West Michigan Car and Machine Company, with a capital stock of $250,000, of which $125,000 is taken by the creditors and $50,000 by the Chicago & West Michigan road. The directors are: C. M. Heald, of Grand Rapids; S. A. Fuller, of Cleveland; C. H. Hackley, H. Park, L. Kanitz, J. J. Howder, and W. S. Wood, of Muskegon.

President Oakes, of the Northern Pacific, is quoted as saying: "Our shops at Edison will be ready for occupancy early in September. They have cost, with machinery, $2,000,000, and will enable us to build anything there, from a hen car to a locomotive. We contemplate the construction of at least one-half of our additions to rolling stock at that point. We expect to complete the branch lines now under construction by the end of the year, but do not intend to undertake any new construction in any direction for the present, except outside of some coal spurs for the accommodation of our increasing output of coal."

The opening of the new Inter-Urban line, between St. Paul and Minneapolis, has discovered the fact that outside the cities and while traversing some six miles or more of the distance which is beyond the pale of the water mains, on certain favorable days the dust is found to be a no small and decidedly unpleasant feature of an otherwise delightful ride. To remedy this evil there is almost finished at the shops of the Minneapolis City Railway a giant tank, made of one-eighth inch boiler iron, and mounted on a flat car carried on four 36 inch wheels. A piece of four-inch steam pipe capped at each end, and suitably perforated with small drill holes, rests across the rear platform. The connecting pipes, of the same diameter as the cross pipe, connect it with the tank and insure a bountiful supply of water. It is intended to draw the tank car behind a motor car, and by making a trip every two hours the entire length of the line will be sprinkled in a round trip of eighty minutes.

The Cologne Gazette of June 15 has an account of a rail road accident at Basle, Switzerland, in which an excursion train was precipitated into a river and a number of lives lost. That the entire number of passengers was not lost is due to the Westinghouse air brake. The account says:

"The unfortunate train was filled with passengers, because many people from Basle were going to visit the singing festival at Moenchenstein. The new bridge close to the station spans the River Birs above rapidly flowing waters. The train consisted of two engines, two fast freight cars and ten coaches. The bridge broke in two. The entire first part of the train was precipitated into the river, but six of the coaches remained on the track, held there by the tearing apart of the couplings which brought the Westinghouse automatic brake into action and resisted further progress. Up to the present 65 bodies have been found. Forty-one seriously injured passengers are lying in the Basle Hospital. The work of clearing away the débris is being performed slowly."

Editors of mechanical papers, railroad and otherwise, enjoy great privileges not vouchsafed to the rest of mankind in the offers they receive of interest in patent articles for the small equivalent of using their influence in getting the patent appliances put on the market. The fortunes we have had figured out as a sure thing if we would simply float into popularity certain car couplers, journal bearings, valve motions, furnaces and other things of curious form are enough to make us financially giddy. We understand that of late our friend John A. Hill, editor of the *Locomotive Engineer*, has become the object of the attention of inventors. John is always free to give advice, and free advice is what a good many inventors are looking for. A Western man lately wrote to John saying that he had invented an apparatus for holding a cow's tail at the milking period and he offered the editor of the *Locomotive Engineer* a half interest to put it on the market. John wrote back that if he had invented a thing of that kind he would put it on a cow. That line of advice was not appreciated.

Several New England railroad companies are getting light passenger cars built, by the Wason Manufacturing Co. for suburban traffic, similar in capacity and weight to the cars used on the elevated railroads of New York. The cars for the Boston & Maine have Miller couplers and buffers, and are of the proper height to couple with ordinary cars, although the floor is a trifle lower. They are 40 feet long, have seats for 48 persons and weigh only 15 tons. This makes a difference in dead weight of over 100 pounds per passenger as compared with the ordinary 70-seat car, and the light cars have longitudinal seats, except for a short distance in the middle, so that there is more standing room available in case of a rush. These cars cost about $1,000 less than a standard 70-seat passenger car of similar finish. The Boston & Maine cars have sliding doors and Wood's platform gate. These gates when shut hang so that their lower edges are close to the end of the platform, thus doing away with the large space, liable to bother careless passengers or children, which is found in some platform gates.

Proceedings of Railway Master Mechanics' Association.

The twenty-fourth annual convention of the American Railway Master Mechanics' Association was called to order by President Mackenzie in the hall of the Stockton Hotel, Cape May, on June 16, at 10 A. M.

The roll call showed that the following members were present:

Thomas Aldcorn, L. Ames, W. L. Austin, J. Davis Barnett, J. N. Barr, John Bean, John Bisset, Chas. Blackwell, J. M. Boon, W. A. Brown, R. W. Bushnell, John Campbell, M. T. Carson, F. D. Casanave, J. J. Casey, N. E. Chapman, T. L. Chapman, David Clark, Isaac W. Clark, John W. Cloud, John S. Cook, C. H. Cory, A. J. Cromwell, G. W. Cushing, J. F. Divine, Alonza Dolbeer, T. Downing, W. C. Ennis, G. T. Ettinger, G. A. Ferguson, F. J. Ferry, W. A. Foster, C. E. Fuller, William Fuller, H. D. Garrett, William Garstang, T. W. Gentry, George Gibbs, J. C. Glass, J. B. Glover, Albert Griggs, B. R. Harding, William Hassman, E. M. Hedley, F. Hedley, John Hickey, S. Higgins, S. H. Hodgman, W. L. Holman, E. E. Hudson, F. Hufsmith, O. H. Jackson, Jacob Johann, G. R. Joughins, I. N. Kuhlbaugh, J. N. Lauder, F. M. Lawler, H. L. Leech Pulaski Leeds, Wm. H. Lewis, Jacob Losey, H. A. Luttgens, John Mackenzie, Jas. Maglenn, Edward May, J. S. McCrum, John McKenna, John Medway, James Meehan, J. B. Michael, Thomas Millen, W. H. Miller, Stott Mills, H. Monkhouse, Wm. Montgomery, J. E. Morrell, L. C. Noble, J. S. Patterson, L. B. Paxson, Peter H. Peck, Joseph S. Porter, G. H. Prescott, R. M. Pringle, T. B. Purvis, Jr., A. W. Quackenbush, W. W. Reynolds, M. J. Rogers, George B. Ross, Wm. Rutherford, Aug. Schaeffer, J. H. Setchel, J. P. Seward, J. C. Shafer, D. O. Shaver, J. F. Sheahan, Jas. M. Sheer, E. T. Silvius, Angus Sinclair, W. T. Small, C. E. Smart, Geo. W. Smith, Wm. Smith, W. T. Smith, H. N. Sprague, F. Stamelen, Geo. W. Stevens, O. Stewart, F. A. Stinard, Henry K. Stout, James Strode, J. J. Sullivan, Wm. Swanton, H. Tandy, C. F. Thomas, W. H. Thomas, Calvin G. Turner, W. A. Walden, Beriah Warren, Amos H. Watts, E. L. Weisgerber, Reuben Wells, G. W. West, A. M. White, D. A. Wightman, E. A. Williams, S. M. Vauclain.

Associates.—D. L. Barnes, W. D. Crosman, M. N. Forney, John A. Hill, W. H. Marshall, L. R. Pomeroy, Thomas Shaw, John Y. Smith, W. A. Smith.

An address of welcome was delivered by Senator Reyburn.

PRESIDENT'S ADDRESS.

President Mackenzie delivered his inaugural address, in which he dwelt at some length upon the continued efforts to reduce the cost of transportation to its lowest possiblity, and the important part the mechanical department was performing in the working out of the problem. He directed attention to the public demand for safety appliances for locomotives and cars, and recommended the co-operation of the Association with the work of the Interstate Railroad Commissioners. The death-roll has been mercifully light during the year, but the Association has lost one ordinary and one honorary member.

REPORT OF SECRETARY AND TREASURER.

The reports of the secretary and treasurer showed that the Association was in a very prosperous condition financially and in point of the number of members. There has been an increase of 95 members during the year.

CHANGES OF CONSTITUTION.

Several changes were made in the constitution. Applications for the privilege of associate have to lie over for one year before being voted on. The Executive Committee is empowered to restore members to the roll whose names have been dropped for non-payment of dues. Establishments engaged in the manufacture of cars are now entitled each to send two representatives for membership in the Association.

NEW ASSOCIATE MEMBERS.

Professor A. T. Woods, W. D. Crosman and W. H. Marshall were admitted as associate members.

TO DRAW THE CONVENTIONS CLOSER TOGETHER.

Mr. O. Stewart, who was chairman of the committee appointed last year to confer with a committee of the Master Car-Builders' Association about bringing the conventions closer together, reported that the joint committee had recommended that the Master Car Builders' Association meet on the second Wednesday of June and that the Master Mechanics' Assocation meet on the Monday following. The recommendation was also made that a joint committee, composed of the president, three vice-presidents and secretary of the Master Car Builders' Association and the president, two vice-presidents, secretary and treasurer of the Master Mechanics' Association should select the place of meeting. The report was adopted.

TO INCORPORATE THE ASSOCIATION.

A resolution was adopted directing the secretary to take the steps necessary for incorporating the Association under the laws of the State of New York.

SAFE HEAT FOR FLANGING STEEL.

Mr. Charles Blackwell proposed as the first subject of the noon-hour topical discussions, Can steel be flanged safely at other than a red heat? He directed attention to the dange of flanging steel when it had reached the temperature represented by the blue color, and showed specimens of boiler steel that had cracked badly when bent at the blue heat, although the same pieces had been bent cold and at a red heat without showing the least signs of cracking. He drew attention to the fact that the Boilermakers' Association had recommended that flanging should be done at a good red heat, and that not a single blow should be struck after the sheet had reached a temperature of cherry-red in daylight. Iron as well as steel is brittle at the dull red temperature, and the belief was expressed that sheets are often damaged by being flanged at the brittle temperature.

Mr. Shaw thought that in his 30 years' experience in working steel he may have sometimes condemned sheets as cold short, when the real trouble was that it had been bent at the brittle temperature.

Mr. J. N. Lauder had been aware for several years that steel was brittle at a certain temperature. Had tried many experiments with steel plate and found that it invariably cracked when bent at the blue heat, although it would bend cold without distress. He had warned his boilermakers about this source of danger and urged other members to do the same.

Secretary Sinclair said that the subject had been discussed at the Society of Mechanical Engineers some years ago, but that had not brought the source of danger into the prominence it deserved; wanted to have it properly ventilated among boilermakers.

Mr. Pulaski Leeds believed there was a danger point in the working of steel, and for that reason he had not favored the use of steel axles and crankpins, because he thought when a journal got hot enough to reach the dangerous temperature it was likely to incur cracks which would afterward lead to breakage. He believed that in ordinary flanging the heat left a zone of the sheet at the brittle point, and he thought that cracking might be produced there by the vibrations from the hammer.

Mr. A. J. Cromwell directed attention to the damage often done to square tool steel by being heated so rapidly that the corners got burned before the body got properly heated.

Mr. John Hickey was inclined to think that the amount of carbon in the steel might exert influence in leading to cracking at a low temperature.

Mr. Lauder was anxious to know if basic steel acted like the specimens exhibited when bent at the brittle temperature.

Mr. James Meehan had tried basic steel under all temperatures and found no fracture. Thought that the phosphorus was so thoroughly eliminated from basic steel that the defects in working at the brittle temperature were not present. His experience with basic steel gave him great confidence in the material, and he had lately used it for a set of crank pins and a set of rods.

Mr. George Gibbs had analyzed a great deal of steel plate, and he did not see how being made by the basic process would make any difference in the quality. The basic process merely enabled steel makers to use inferior ores. Believed that the critical point of working steel would be dangerous, no matter how little phosphorus remained in the metal.

Mr. C. F. Thomas then read the report of the committee on

EXHAUST PIPES, NOZZLES AND STEAM PASSAGES.

This committee made original investigations to ascertain the best form of exhaust pipes, nozzles and steam passages. They found so many varied conditions in the dimensions of exhaust pipes which influenced the results, that they left to the users the size of pipe best suited to their conditions. They held that the aim of the designer should be:

1st. To choose such size and shape as to secure free steaming.

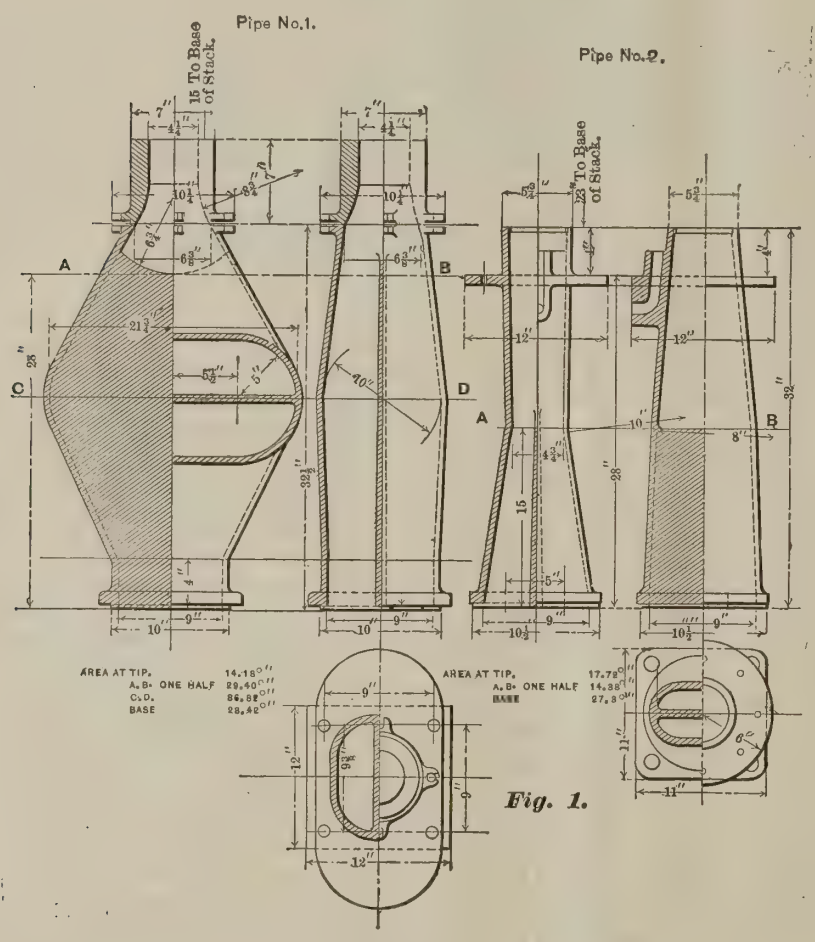


Fig. 1.

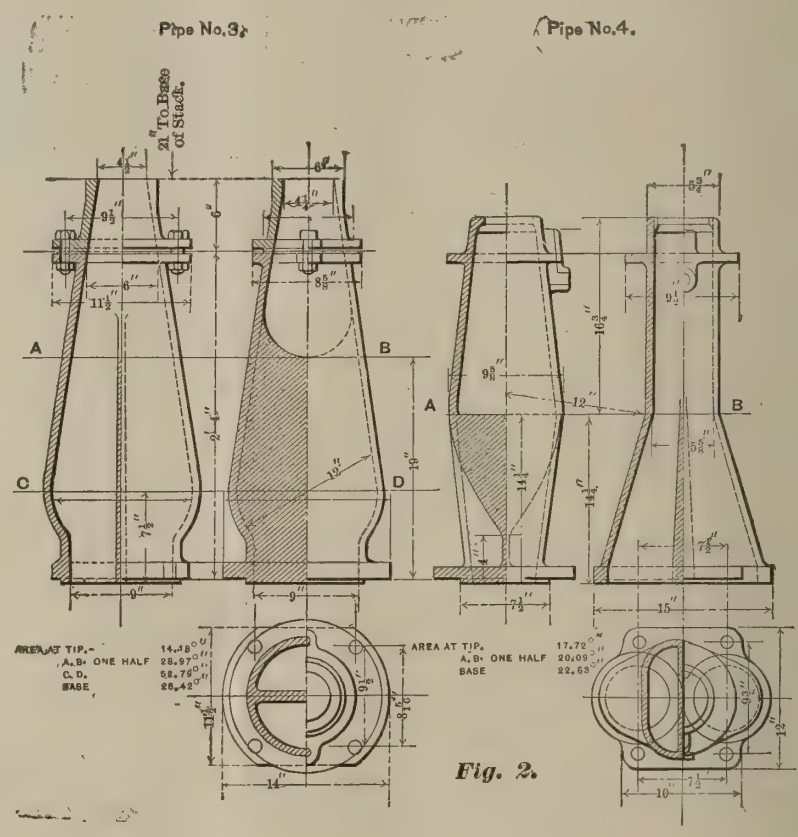


Fig. 2.

2d. The exit of the steam should be as free as possible, to avoid injurious back pressure.

3d. The discharge should be as nearly central with stack as can be, so as to produce maximum effect.

4th. Exhaust from one cylinder should not blow over into the other.

5th. The exhaust pipe should terminate at such distance from base of stack as to insure its being completely filled at each discharge.

The members of the committee had limited experience with the use of double nozzles, but they considered that the best results could be obtained from a single nozzle exhaust pipe.

In designing this form of exhaust pipe it was maintained that the most vital point is the relative areas of the combining point of the pipe and of the nozzle. If the combining point is largely in excess of the nozzle area the exhaust steam will blow over into the other cylinder, but if the nozzle is larger than the opening at the combining point the exhaust steam will tend to draw from the other cylinder.

The height of the bridge cuts no figure in affecting the back pressure. Lowering the bridge gives the designer the means of straightening the discharge passage. The suggestion was made that the bridge be placed from 3 to 4½ diameters of the tip below the top of the pipe, and that sudden changes of form be avoided. The proper height of exhaust pipe was held to be the distance that would insure the filling of the base of the stack with the exhaust steam. They did not favor making a steam reservoir of the exhaust pipe. A petticoat pipe in connection with a high exhaust pipe and open stack was not found of any use. When an exhaust pipe was properly constructed to insure a central discharge the proper height of the nozzle was said to be from 20 to 25 inches from the base of stack.

Experiments were made with the five different forms of exhaust pipes illustrated herewith and the conclusion come to was that pipe No. 2 gave decidedly the best results.

A decided stand was taken in favor of the taper smoke stacks. The point was made that decreasing the diameter of the smoke stack generally made it possible to increase the

size of nozzles. Most of the investigations were made by Messrs. C. F. Thomas and A. W. Gibbs, members of the committee, and they express thanks for help given by Mr. James Meehan, of the Cincinnati, New Orleans & Texas Pacific, and Mr. J. D. Campbell, of the New York Central.

Mr. Thomas said that since writing the report he made some experiments by changing the openings of tip and junction point, and the results showed that the tip was the decisive point in affecting the back pressure.

Mr. Lauder noticed from the indicator diagrams that opening the nozzle larger than the junction point had decided effects in reducing back pressure in the cylinders. He believed in making the exhaust nozzle as large as possible. He favored the use of a single nozzle, but had never been able to find out why a single nozzle admitted of a larger tip than double nozzles. Had never been satisfied with the common explanations of how a large single nozzle would make steam when the same size could not be used in a double pipe.

Mr. G. W. Cushing preferred the single nozzle, and thought it could be used more economically than double nozzles.

Mr. Geo. Gibbs wished to see a theory of the action of the exhaust formulated, in order to help in designing exhaust pipes. Thought the exhaust steam acted in different ways in creating draft. In some cases it acted like a piston in the stack, in other cases it acted as a jet exhauster acting on the gases by friction. The common locomotive probably created draft by a mixture of the two actions—the piston and the jet. From experiments made he believed that the exhaust steam from the nozzle acted more like a column than like a cone that would instantly spread out to fill the stack.

Mr. Thomas had experimented with the exhaust, but was

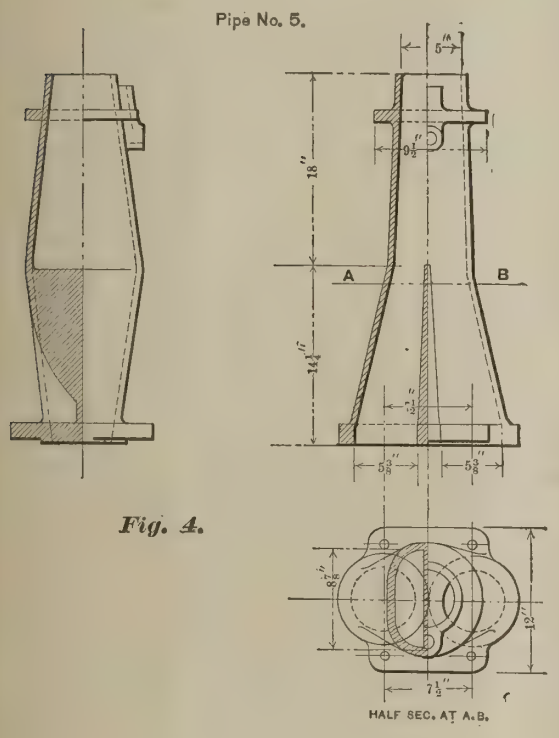


Fig. 4.

yet unable to determine whether the draft was caused by a piston or a jet action.

Mr. L. R. Pomeroy mentioned that the Pennsylvania Railroad people at Altoona are experimenting with different forms of draft appliances, in a line very much the same as that followed by the committee.

Mr. O. Stewart described experiments that he had made with exhaust pipes and smoke stacks of various dimensions. By a tentative process he had enlarged the exhaust pipe till it is 11 inches diameter for the larger engines. With a smoke stack 18 inches diameter this exhaust pipe required a single nozzle of 4¼ inches. By reducing the diameter of the stack he was able to enlarge the size of the nozzle till he got it to 4¾ inches. The stack was then 13 inches diameter at the base. He found considerable improvement in steaming was effected by lowering the nozzle from 18 inches below the stack to 24 inches.

Mr. McCrum said that he was using the reservoir exhaust pipe satisfactorily, and the engines worked much better than with the small pipe. He was experimenting with the nozzle opening a little lower than they had been accustomed to placing it, and the change was very promising.

Mr. West favored the use of double nozzles. The best results in steaming were obtained with an open stack when the nozzles were placed about three inches below the center of the smoke box.

Some further discussion ensued, participated in by Messrs. Shaw, Barnes, Thomas, Sinclair, Lewis, and Gibbs.

Next subject taken up was the reading of the report of the committee on

IRON AND STEEL AXLES.

The committee regretted that they were unable to submit a satisfactory report for the reason that they had ascertained little new information respecting the relative value of iron and steel axles. The answers to the circulars sent out had been very meagre.

The report said there is a conflict of opinion among members as to the relative value of iron and steel durability between turnings. A case is mentioned by Mr. A. T. Hatswell, where iron axles have run between 200,000 and 300,000 miles without turning, and they still calliper perfectly true with a reduction in diameter of about $\frac{1}{32}$ inch. On the other hand, Mr. E. B. Wall voices the experience of several large roads by saying that steel axles give the greater service between turnings. But he could not give any comparative mileage of iron and steel axles, for the reason that they do not have axles made of the different material running under the same engine. Unless this is done a comparison is worthless.

Extracts were given from a letter from Mr. Ely, of the Pennsylvania Railroad, to the effect that his company were using steel axles largely and very satisfactorily. He mentioned cases of breakage on steel axles, where the fracture had originated in the hole drilled for the key way. On account of that they now mill the key ways. The committee was John Mackenzie, J. S. Graham, J. S. Cook, E. B. Wall and Thomas Shaw.

Mr. West said they were using steel axles exclusively with good results.

Mr. William Smith said they used iron for axles and crank pins. They shouldered their driving axles in the middle of the wheel fit and breakages were now unknown, although they were common before this practice was introduced. Axles are removed after 10 years' service.

Mr. Swanston said they were using steel axles exclusively. He believed the journal wear was greater with steel than with iron, and that the life of the axle was a little shorter but was more reliable than iron.

Mr. Lauder believed the sentiment of the association was steadily growing in favor of iron for axles, crank pins, piston rods and other parts subjected to severe strains. Thought good hammered iron was best for every part of a locomotive except for the boiler, where steel was preferable. Steel for axles and other parts calls for more careful designing than iron.

Mr. Setchel argued against any sudden changes of size or form in axles or other parts. Was against abrupt shoulders on wheel fits or other parts of an axle.

Mr. Sprague uses steel axles, crank pins, etc., and hears no complaint from them. They receive the blooms and make their own forgings. Finds that the mild steel case hardens as easily as iron. Did not think Bessemer steel was suitable for any part of a locomotive.

Mr. Hickey thought that the difference in the experience with steel was due to difference in the material. Steel that might be an entire success for one purpose was a failure for something else. Believed that it should be more definitely stated what the characteristics of the steel required.

Mr. Sinclair mentioned some cases of Bessemer steel axles that failed to endure the Master Car Builders' test.

Mr. Vauclain stated that the Baldwin Locomotive Works make their own steel forgings from blooms of known quality. They find good iron axles and good steel axles both satisfactory, but they prefer to make the axles themselves.

Mr. A. Griggs stated that he has used crucible steel for years for axles, crank pins, etc., with uniform success. The quality of the steel is first class.

Mr. Gibbs: The quality of steel to be used for axles is spoken of as all-important, but how are you going to specify beforehand the proper characteristics? They had had a limited experience with steel axles, but it had been very unsatisfactory. Find it wears more rapidly than iron, heats more rapidly and is more apt to break.

Mr. George Gibbs then read the report on

LABORATORIES, CHEMICAL AND MECHANICAL.

The report said: There are few mechanical officers in railways who have not felt the necessity of relief from the incessant calls upon their time in reporting upon and deciding questions of a purely scientific nature, or those bearing upon the unfamiliar details of the industries under their charge. In addition to the time consumed, the mental strain induced by the uncertainty of the completeness and accuracy of the information obtained leads to results which are either erroneous or of little utility. No officer entrusted with the vast responsibilities of conducting the business operations of a railway department can devote sufficient time to the study of scientific knowledge in the engineering profession of the day, and be in a position to fully utilize its benefits. The needed relief has been sought in the establishment of a department constituting a scientific and trained practical authority in the systematic treatment of a mechanical subject. The organization and conduction of such a department is possibly one of the most delicate specialties connected with railway work, and it is possibly owing to this fact that the growth of the testing department idea has been slow. The degree of benefit to be derived from the department depends directly upon the ability both in theory and practice of the men put in charge. Since the investigations required are both chemical and physical, scientific and practical, it will be seen that the chief must be somewhat versed in all these branches. It is not desirable that he should be a specialist, but rather a man with good theoretical and practical education, trained to accurate reasoning and to sound judgment; he should have had broad experience, and be able to generalize from the reports of his subordinates in such a shape that his statements will relieve his superior officers from the necessity of going into details. He must be able to plan methods of testing and experimenting, and see that they are properly carried out. He should not be looked upon as an adjunct of any one department in the road, but all should draw upon him alike in problems falling in his province. It will be seen, then, that there is no slight danger in picking out a suitable head, and that an incompetent or narrow man will act as a hindrance to economical operation.

Regarding the two divisions, mechanical and chemical, the committee hold that they should be in the closest possible relationship. In some instances one branch might be established without the other to suit the needs of a company.

The methods of investigation advocated were those that would produce the best practical results. The first work likely to be most profitable is routine work, physical and chemical work. After these come special work, such as tests of the efficiency of machines, fuels, patented devices, trials of purification of water, timber preservation methods and others.

A variety of illustrations were given showing the character of the work to be done and the necessity for discriminating and properly trained engineers to be in charge of the work. Valuable suggestions were given in connection with the kind of tests to be made and the examination of material. The relations between the purchasing department and the testing department should be close and cordial.

In regard to the influence of the testing department on cost of material, the report says:

The only well defined tendency toward increasing cost is in establishing a perfectly reliable standard of quality. The magnitude of this tendency will, of course, vary with different roads, and can only be considered for each case separately. It will be conceded that a certain standard for quality is necessary for safety, and a well organized department establishes only this necessary grade. On the score of safety to life and property, therefore, the results to be obtained in this way from a testing department would seem to constitute one of its most valid claims to our consideration. Another of the benefits—and not the least conferred upon the railway world by the establishment of testing laboratories—is that through them manufacturers have become better acquainted with the requirements of railway practice, and have been brought to modify their methods to meet our requirements, and that with the least increase of cost consistent with the requisite quality. A close watch from year to year upon the variations in the character of material received through a testing laboratory will furnish convincing testimony to the truth of this statement.

A plan of organization was outlined, and particulars of a testing equipment and the cost of the same were given. The committee were George Gibbs, Geo. W. West, L. S. Randolph and D. L. Barnes.

DISCUSSION ON MAKING TESTS.

Mr. M. N. Forney, speaking on the report on laboratories, thought that the success of a mechanical laboratory depended entirely on the ability and clear headedness of the men in charge. Capacity for careful observation in most people is so defective that they do not actually see what does occur. It is highly important that those making tests should observe facts accurately and reason correctly from the facts, otherwise wrong and misleading conclusions will be drawn.

In regard to indicator tests, he had had a good deal of experience in indicating locomotives, but he had never known a case where any one had learned anything from an indicator that was worth knowing.

Mr. Wm. Smith considered a laboratory essential to the proper examination of railroad supplies.

Mr. Shaw differed from Mr. Forney about the value of the indicator and considered it a valuable instrument for examining the pulse of the cylinder.

Mr. S. M. Vauclain had found out a great many things worth knowing by using the indicator. While a locomotive is not built to make indicator diagrams, it is essential that it should produce good diagrams.

Mr. Hickey had been greatly instructed by diagrams taken from locomotives, and they had suggested important improvements.

Mr. Sprague was glad to hear Mr. Forney say something against the indicator. He thought the practice of men of experience in perfecting valve motion was equally satisfactory with the results of indicators. Did not believe in the indicator.

Secretary Sinclair spoke in favor of the information obtained by the use of the indicator. The high-class engine of this country has been developed by engineers who constantly used the indicator as a counselor and guide. Saw no reason why the indicator should not be equally useful in improving locomotives.

Mr. J. W. Cloud had used the indicator a great deal on locomotives and learned much from the diagrams taken. The fact that some gentlemen who have never used an indicator can get a perfect card from a locomotive is evidence that the indicating work of others has been used to advantage in designing. We are confronted now with compound locomotives, and he believed that the indicator would play an important part in developing that type of engine.

Mr. G. Gibbs favored using the indicator to find out the faults of locomotives, not to make fine diagrams from engines that were working satisfactorily. They had lately learned by using the indicator that a certain class of engines had dry pipes too small. Considered that many important things could be determined from indicator diagrams.

Mr. Meehan related particulars of several cases where he had discovered defects in locomotives by using the indicator. He could name many more things discovered by use of the indicator that it was not possible for an experienced engineer to find out by ordinary practice.

Mr. Leeds considered that the instruments of the laboratory took a short cut to find out things which practical experience was likely to demonstrate by more tedious methods. Mentioned a case where a tedious series of investigations were made to find out what was wrong about an engine, and it was ultimately discovered that the cones of the steam passges had got displaced, partly closing the passage. The indicator would have identified the defect at once.

Mr. W. H. Lewis (C., B. & N.) considered that the indicator gave a photograph of the work the locomotive was doing. The indicator diagram not only gives valuable information about the distribution of steam in engines that are not working satisfactorily, but it has been the means of disseminating valuable information about the action of steam in the cylinders.

Mr. Barnes did not consider it reflected credit on the committee to discuss such an elementary matter as the indicator. Favored discussing matters concerning the large rejection of material after laboratory tests mentioned in the report.

DISPOSAL OF THE BOSTON FUND.

The committee appointed to arrange for converting the Boston Fund into scholarships in a technical college, reported that the Stevens Institute of Technology and the Cornell University had each offered four scholarships for the fund. The committee recommended that the offer of the Stevens Institute be accepted. The scholarships are to be for sons of members of the association and it is essential that the

candidate shall have worked at least one year in a machine shop. If more than one candidate applies for a scholarship, he who passes the highest preliminary examination will be entitled to it.

After some discussion the report was adopted.

ELECTION OF NEW HONORARY MEMBERS.

Secretary Sinclair spoke of the past services rendered the association by certain members who are now out of active service in the mechanical departments of railroads, and proposed that the following be elected honorary members, viz.: John Black, E. T. Jeffery, Morris Sellers, F. L. Sheppard, J. Mulligan, Jacob Johann and J. F. Divine.

The members were elected.

DISCUSSION ON COMPOUND LOCOMOTIVES.

Mr. Vauclain said that being connected with the Baldwin Locomotive Works they had watched the progress of compound locomotives and concluded it time to introduce them to the railroads of the country. They carefully examined the different forms of compound locomotives in use and believed that none of them were entirely suited for the work to be done on American railroads. They did not consider that sufficient power could be obtained from the two-cylinder type of locomotive to equal the requirements of heavy service. Did not think there was room on all roadbeds for the spread of cylinders necessary for the larger size of compound locomotives if two cylinders were employed. They therefore decided to adopt a four-cylinder compound locomotive. A high and low-pressure cylinder is used on each side. This provides for any power required, and it has the advantage that the receiver is done away with, and the admission of steam for both cylinders is governed by one valve. If the engine should break down on the road it is not disabled, as one side can be kept at work. There is ample starting power for any train. He wanted a committee appointed to investigate the subject of compound locomotives, the selection to be made of men who have formed no opinion of compound locomotives. They lately built a compound locomotive for the Australian government equal in power to the standard consolidation engine in use in this country. This engine was tried on the Lehigh Valley, the Philadelphia and Reading and the Pennsylvania railroads with great success.

They had taken indicated diagrams from a standard simple engine, and the water consumption varied from 26 to 30 pounds per horse power. For a compound locomotive they obtained a water rate of from 17 to 21 pounds per horse power per hour. In addition to the direct saving due to doing the work with a smaller consumption of water, the compound locomotive worked with a lighter exhaust and wasted no fuel by throwing it away in the form of sparks. While working with the compound on the Pennsylvania Railroad they hauled a train from Harrisburg to Altoona with a consumption of 13,000 pounds of coal, and a standard locomotive belonging to the company used 26,400 pounds in the same distance, pulling a train of five cars less. In the return journey the compound effected a fuel economy of 44 per cent. over the class *R* engine.

In reply to a question from Mr. Barnes, Mr. Vauclain said the ratio of high and low-pressure cylinders employed was 1 to 3. The claim was made that the small low-pressure cylinder possible in the four-cylinder type of engine enabled the steam line to be better maintained than it could be in the low-pressure cylinder of a two-cylinder compound. Did not see how the cylinders of a two-cylinder compound could be carried with a ratio of 1 to 3. Asserted that there was great trouble with the pistons of two-cylinder compounds breaking. They have got an order for five locomotives with cylinders 24×28 inches, and the boiler 78 inches diameter. Wished to know how cylinders representing that power could be used on a two-cylinder compound.

Replying to a question from Mr. Hickey, Mr. Vauclain said they objected to a receiver because it detracted from the power of the engine. Thought that everybody who had used two-cylinder compounds with receiver found that the larger the driving wheels the better the results obtained. They, on the other hand, did not care how small the driving wheels might be or how great the rotation speed. Have had an engine running with a piston speed as high as 1,480 feet per minute.

In reply to a question from Mr. Forney as to the complication of a four-cylinder compound locomotive, Mr. Vauclain argued that the only complication was in the foundry. He was willing to build a compound locomotive for a committee of the association to test. He wanted a committee of earnest men who have expressed no opinion in favor of any particular type of compound. Had furnished the names of gentlemen that might be selected from.

Mr. Barnes ventured to say that from an examination of the indicated diagrams the work was done by the compound engines with 50 per cent. less water than the simple engine. He calculated the total saving of the compound engine to be 65 per cent.

Mr. Vauclain said that the greatest economy was to be looked for in freight service. With high rotative speed the economy decreases as the speed increases. Mentioned a case where he found that the compound used nearly as much water while hauling a train on a level as when working on a grade where 25 per cent. more power was required. On examining the indicator diagrams found that the loss of economy was due to the higher piston speed when running on the level. The water rate increased from 17 to 22 pounds per horse power.

Mr. Gibbs said that more accurate information respecting compound locomotives is likely to be obtained within the next year, for railroad companies are moving to find out for themselves the actual economy of the compound principle. The real truth is much more likely to be found out that way, for then no one is interested in making the compound appear more valuable than it is. He was struck with the extraordinarily low water consumption reported by Mr. Vauclain. When we hear the claim made that a compound locomotive saves from 30 to 40 per cent., the suspicion is aroused that the economy is not all due to compounding. If part of the saving is due to the softened exhaust of the compound it ought to be possible to secure a portion of that economy with a well designed simple engine.

Mr. A. M. White, Schenectady Locomotive Works, defended the two-cylinder type of compound locomotive from the reflections cast upon it. His company decided to build that form of engine because investigation of the compound locomotives in use on European railways indicated that the two-cylinder form was most successful. They built a two cylinder compound for the Michigan Central which was put to work 18 months ago, and was so successful that the company ordered another one, which is now pulling the fastest trains on the road. Two consolidation and a ten-wheel compound were built for the East Tennessee, Virginia & Georgia, and have been at work over a year. Working against simple engines of the same capacity, the economy is from 17 to 30 per cent. Several other compounds have been built and orders continue to be received. The compounds are highly popular with the men handling them on all the roads where they are.

Mr. White criticised the design of the four-cylinder compound on account of complication of parts, the connecting of two pistons transmitting unequal power to one crosshead, and to the exhaust steam passing round the live steam. In regard to the statement that there was no room on the roadbed for the spread of cylinders for a large two-cylinder compound, he held that it was a detail of designing easily worked out.

Mr. Quackenbush then read the report of the Committee on

PURIFICATION OF FEED WATER.

This report was made up principally from the experience of members with different forms of purifiers as recorded in answers to circulars. The report concludes:

To sum up the information, your committee gleans the fact that up to the present writing the efforts to purify the foul water and soften the hard waters, especially for locomotive boilers, have proved unavailing, and there is still much room for experiments in this direction. The sentiment of those who have expressed themselves is in favor of a mechanical device as against the use of chemicals or compounds. Your committee has not the information at hand that would warrant the recommendation of any device, but directs attention to the Barnes Mechanical Device, which, from a mechanical standpoint and the evidence before us, warrants us in taking this action.

The evidence is preponderant, and almost unanimous against the use of chemicals or compounds, while with the use of oils there is ever danger unless the greatest of care is exercised in placing it in boilers, as it cannot be surmised what mischief it is working by adhering to crown sheet or other parts coming in contact with the fire. Your committee is skeptical on this point, having personal knowledge of the damage arising from such practices.

Mr. Gibbs had paid a great deal of attention to the subject of water purification, and he did not feel nearly so discouraged as the committee appeared to be. There are certain classes of water that can be purified readily at small cost without damage to the locomotive. They are purifying incrusting waters very successfully with a soda compound. The soda acts on the lime and precipitates it in the form of soft mud that can be readily blown out. They can purify water by this means that has not more than 30 grains of lime to the gallon. One of their engines that has been regularly treated by the compound has run 150,000 miles without having any boiler repairs done. The boiler of this engine was kept clean at a cost of about two cents per hundred miles.

Mr. Boar described a variety of mechanical devices that he had seen tried to prevent the formation of scale in locomotive boilers, but they all failed. The great variety of water on some roads prevented them from being successfully treated by chemicals. From his own experience he concluded that the very poorest investment a railroad could make was to put in a compound or a mechanical device for cleaning boilers.

STATUS OF THE CAR-COUPLER SYSTEM.

Mr. Hickey, as chairman of the committee having this subject in charge, reported that the committee had been unable to prepare a report. From the tone of correspondence received on the subject he concluded there was a desire among members to dispense with the link and pin coupler and to substitute an automatic coupler. There is also a feeling that the vertical plane coupler is dangerous when it breaks loose from its fastenings, for it falls on the track and is liable to derail the train.

Mr. Wm. Garstang submitted the following resolution:

"I move that it is the sense of this convention that the use of the vertical plane coupler is more in the direction of progress, and that the committee be continued with power to represent the Association before the Board of Interstate Commerce Commissioners." The resolution was carried.

Next business taken up was the reading by Mr. L. R. Pomeroy of the report of the Committee on

EXAMINATION OF LOCOMOTIVE ENGINEERS AND FIREMEN.

The committee having this subject under investigation issued a circular to collect information respecting the selection of locomotive engineers' examinations that firemen are subjected to before being promoted. The replies indicated the prevailing sentiment to be that it is not considered best to hire engineers, as such, from other roads, but to make or educate their own engineers from the ranks, and by so doing have men that are better adapted to the requirements of the particular service required, a better opportunity is afforded for more intimate and satisfactory knowledge as to the character of the men, and does not place any hindrance to the best incentives and inducements for men in the ranks who are looking and working toward the higher positions.

(b) But with such as new roads and isolated systems it is not possible to educate or make all their own engineers, and it is deemed best to give applicant same examination as to firemen candidates for promotion; in addition to this have to furnish satisfactory evidence of character and disposition from the roads where the applicant has been employed.

It appears that the practice of subjecting candidates for the position of engineer to some sort of examination is becoming general. The greater part of the report was devoted to describing a plan of progressive examinations proposed by Mr. John A. Hill, editor of the *Locomotive Engineer*. The outlines of the plan are:

First.—Select good, clean material, inspect for culls, and have some quick and fairly accurate method of testing for such defects as would prevent the candidate from ultimately becoming a first-class engineer.

Second.—Provide the opportunity and means, or at least point out the way to the student to learn the rudiments of his business; first, teach him how to fire before he goes head over heels into valve motion.

Third.—Provide an incentive to the learning of the right part first, and establish a point at which no progress or any other defect in the candidate for advancement will terminate the apprenticeship. Thus, officers can provide a system of periodical examination of firemen, and advance them step by step until they become proficient enginemen, and abandon the usual rule of putting a conglomerate gang of men on locomotives, letting them fire a term of years, and select the oldest for examination, only to find he is not posted and generally defective.

The progressive plan provides in the preliminary examination a gauge for measuring the character and mental status of the candidate and probable availability for purposes desired.

The first examination occurs after one year's service; the candidate's record and character inquired into and the questions propounded of an elementary order to determine the candidate's foundation work. Especial attention given to the proper understanding of signals.

The second embraces the subject of fuels, combustion, boilers and the duties of firemen.

The third examination occurs after the third year of service, and is a thorough one on the mechanism of the engine, brakes, etc., the examiner requiring a remedy or cure for every conceivable disorder or disabilty to the machinery and complete enough to warrant promotion, upon presenting a certificate of examination on train and time-card rules from the Transportation Department.

This report having excited no discussion, the secretary next read the report on

OPERATING LOCOMOTIVES WITH DIFFERENT CREWS.

This committee found that there was a decided preference for double-crewing engines when it was not possible to assign a locomotive to one regular crew. A small part of those who had replied to the circular preferred the pooling or "chain gang" system.

The advantages of operating locomotives with more than one crew are that it saves a large investment of capital in power, decreases the amount of fuel wasted in housing, banking fires and restarting them, and saves roundhouse room and fuel and plant for warming them in severe weather; where there are an unequal number of trains in opposite directions, the pool system gives the men exactly equal hours of rest and equal work. By the double-crew system almost as much service can be secured as by the pool system, but not as even chances for the men.

The greatest disadvantage of the pool or chain-gang system is that it relieves the engineers of the sense of responsibility; they lose all interest in the care and maintenance of the engines, and in consequence less miles are made between overhaulings than where the men try to maintain the power. It is almost impossible with any double-crewing system now in vogue to fix the responsibility for the results of misuse or carelessness, such as cut journals, valves, etc. It is difficult for the firemen to learn the peculiarities of steaming of the different engines. The engines are not properly cleaned, and no incentive is offered to the men to be economical in the use of fuel or supplies. The inspection and cleaning usually attended to by regular crews is, in pooling, an extra expense.

The double-crew plan leaves the care of the engine between two crews, and the entire sense of responsibility in not lost, but it is a very difficult matter to arrange the runs, especially on freight, so that the division of hours of labor and rest are equal among the men. And the details of arranging and changing runs are very annoying and unsatisfactory.

The tendency of modern operating is turned toward doing the most business with the least investment for power possible, and it is more than likely that none of the large lines will own engines enough to man each with a single crew and do the work.

Your committee is led to believe that pooling can only meet with success where particular attention is paid to the inspection and repairs; in fact, where they make special provision to care for the engines, as they do on the P. R. R. No road can hope for even comparative success handling the work as they would where engines had their regular crews.

In passenger service your committee believe that the double-crew plan is better than the pool system; the runs can be more evenly distributed, and the double-crews do not lose their sense of responsibility or relax their care of fuel or stores.

In freight service it is a very difficult matter to arrange the runs for double-crewing, and where many "extras" are run, and the seniority of engineers call for the best runs, it is well-nigh impossible.

Where pooling is found necessary, even temporarily, your committee are of the opinion that better results will be secured if extra wipers and cleaners are put on to clean all engines fairly well in a few minutes while the fire is being cleaned, the tank and sand box filled and the engineers oiling around. Hostlers should be provided at terminals and engine taken to a track where all this work can be done at once; at the same time the hostler and his helper should take off the oil and clothes boxes of the crew that brought the engine in, and put on the private boxes of the men who are to take her out; boxes specially designed for handling should be provided. The oil and supplies should be charged to the *crew* and not to the *engine*; this provides a check for wastefulness and is an incentive to be reasonably economical.

Blank reports should be furnished and each engineer be required to turn over one to an inspector on arrival; this, in addition to reporting the work necessary, should contain a few questions, that could be answered by "yes" or "no," that will show the general condition of the engine, how she steams, condition of brakes, and whether or not the engineer considers her in condition for further service without repairs.

Inspectors should be provided at all changing points; these men should be selected from the most experienced and careful engineers, and no work should be done on an engine without the approval of the inspector. This excellent report was signed by W. W. Reynolds, C. G. Turner and John A. Hill.

Mr. John A. Hill mentioned the difficulties of a committee making acceptable recommendations in a case of this kind where members must do the work with the power they have got. The opinion expresed is largely in favor of double-crewing instead of pooling. Did not believe that it was possible to double-crew or chain-gang engines successfully without making special provision for inspection and repair of the engines. The objection generally raised to the chain-gang system is that it takes off responsibility and causes waste of supplies and fuel. Believed that better results would be obtained if the supplies were charged to the man instead of the engine.

Mr. P. H. Peck double-crews the engines when business gets heavy, and he has had better results from that plan than from pooling.

Mr. Wm. Swanston thought double-crewing the best. On some runs they have six sets of men to four engines. This plan works well. Thought chain-ganging would be all right if the men were not prejudiced against it.

Mr. Hill said that objections had been raised to the men not doing work on their engines when they were not assigned to a particular engine. He believed that the man who did least work upon his engine was the most profitable to the company. The care of the wearing parts should not be left to engineers. His experience was that of 50 engineers 45 will do more harm than good by working on their engines.

Mr. G. W. Cushing considered it best to keep one set of men on an engine when it could be done. If not, he favored chain-ganging—every man taking his turn by rotation.

President Mackenzie said the trouble with the double-crew plan was that the crews could not make a satisfactory income.

Mr. Stewart said they gave each man an engine as far as possible. When this cannot be done, owing to press of business, they chain-gang. They have special inspectors for seeing that the engines are in proper running order. Engineers are also required to make reports of anything to be done. He tried a six months' fuel test of double-crewing against pooling and found that the saving by the former system was only one-half of one per cent.

The secretary next read the report on

LOCOMOTIVES FOR HEAVY PASSENGER AND FREIGHT TRAINS.

This committee discusses at considerable length particulars about weight proportions and details of design of mogul and 10-wheel locomotives. Where the real question of the report is discussed the committee says:

The question of economy of operating engines of such proportion as to necessitate either a 10-wheel or mogul engine as against lighter power and more trains is an open one, on which an intelligent opinion can be given only after time enough has been given to observe the expense of maintaining both rolling stock and track. Even then the testimony will be conflicting. We will ask to be excused from offering an opinion on the subject at the present time. That we speak advisedly as to the prospects of conflict of opinion in this matter, we will state that the experience of one of your committee on different divisions of the same system would justify him in having either of two opposite opinions had his observation been confined to only one division. Of five engines identically the same, four were put at work in heavy service where a high rate of speed had to be maintained constantly; while the other was put where trains were not more than 75 per cent. as heavy, the average speed being about 10 per cent. less, other conditions about the same. The four first spoken of soon showed signs of distress, while there was nothing to indicate that the other was any more strained than an average eight-wheel engine would be doing the same work, as she ran alternately on the same trains with three 18 × 24 eight-wheelers. The distress appeared to be altogether in side motion, such as loosening pads on frames and boiler, and other parts affected by side thrust. We have no information as to effect on track.

While ten-wheel and mogul engines have been in use for years, yet they have not been used for fast freight or passenger service long enough to afford a great deal of information from actual experience, and many of the answers are given on general principles.

As a summary we would say, from all information furnished, we gather that the preference is for the ten-wheel engine as against the mogul on account of its being practically the same as an eight-wheel, the forward drivers being simply burden-bearers, and leaving wheel bases actually the same. Next because the distribution of weight is such that, while gaining sufficient adhesion to utilize all the power, there is not an excessive weight on either wheel. For example, an engine properly proportioned for 20 × 24-inch cylinders at high speed will weigh about 130,000 pounds. On a ten-wheeler this would give 32,000 on truck and 98,000 on drivers, while with a mogul we would scarcely put more than 20,000 on pony, leaving 110,000, or, perhaps deducting 2,000 for difference in construction, 108,000 to divide on six drivers. While this weight would not perhaps be destructive to track, it is more so than the 16,333, besides being useless. Again, the majority claim greater safety on crooked roads for ten-wheel engines.

In conclusion, the committee would say that the relative economy of these engines in fast service as against eight-wheel could better be answered in the future than at esent with the limited actual experience we now have.

Some discussion followed the reading of the report, but it dwelt mostly on details of construction, the pony truck and radius bar receiving the greater portion of attention. The preference was general in favor of ten-wheel engines for heavy fast passenger service on the grounds that they were more easily maintained in good running order than moguls.

A letter was received from the chairman of the committee on electrical appliances intimating that there was no report, and recommending that the subject be dropped for the present. This was done.

STANDARDS OF THE ASSOCIATION.

This committee held that the true purpose of the association was more to bring out information respecting forms, than to establish standards. The recommendation was made that standards should be confined to such subjects as the standards already adopted, viz.:

The United States screw-threads, micrometer gauge for sheet metal, limit gauges for bar iron and gauges for driving-wheel centers and tire. These standards and others of a like nature which may be added are important in our dealing with manufacturers, and the general adoption of these will be in the interests of economy, and your committee would recommend that they be maintained and reaffirmed as standards of this association. But the axles for light and heavy tenders and the tests and specifications for cast-iron wheels should not be standard, but should have the indorsement and recommendation of the association, to be adopted by the members as they may see it to the interests of the road they serve. Of the journal bearing, journal box and pedestal, these standards were adopted by a joint committee appointed by the master car builders and this association, and your committee are of opinion that it was proper to approve the recommendation of that committee, but that it should not be regarded as a standard of this association. The only other standard which has been adopted by this association is that of making six miles per hour the standard mileage for engines in switching service. The committee think this is the general practice, and should have the recommendation of the association, but it is not of sufficient importance to be placed on the list of standards.

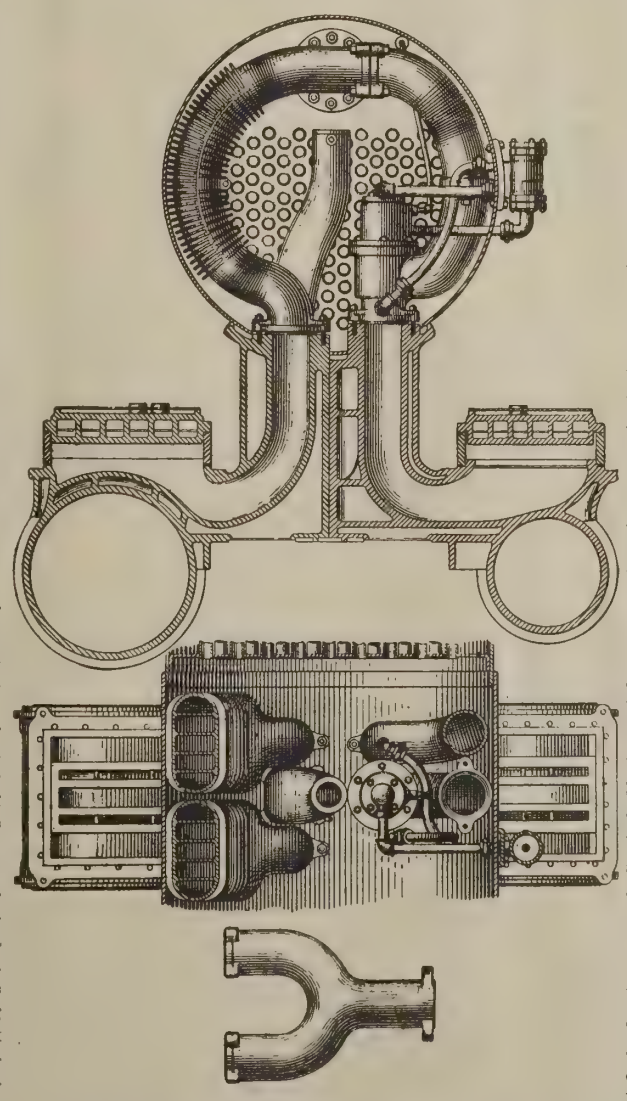
The recommendations of the report were adopted.

Next business was the reading of the report on air-brake standards, which was substantially the same as that submitted to the Master Car Builders' Association and published in our last issue. It was decided to print the rules in the annual report.

The remainder of the business of the convention was of a routine character.

Dean's Compound Locomotive.

The Old Colony Railroad Company have nearly completed in their shops at Boston a four-wheel connected passenger compound locomotive built according to the designs of F. W. Dean, mechanical engineer. The engine will be the same in all respects as the other standard fast passenger locomotives belonging to the company, excepting in the parts that provide for the using of the steam twice



The annexed engraving shows the arrangement of cylinders, steam receiver, intercepting valve and exhaust. The engine has cylinders 19 and 28 by 24 inches. An intercepting valve, with a piston for opening and closing the passage between the cylinders, is used, and there is a reducing arrangement for introducing steam to the low pressure cylinder at starting. Particular attention has been bestowed upon the steam receiver in the smoke-box, which is made of a flattened pipe that has rings round the outside to convey as much heat as possible from the smoke-box gases to the steam passing through the receiver. We expect to give full particulars about the working of this engine when it gets pulling trains.

Mr. O. W. Dean, of Chicago, has patented an arrangement for regulating the brake pressure on freight cars according to the load carried that seems to be thoroughly practical.

The Southern Pacific roadbed is formed of salt through a portion of the Colorado Desert. The engineers in charge think that a flood would make bad havoc on that part of the railroad.

We have received from Mr. William Smith, superintendent of motive power of the Chicago & Northwestern, a blue print showing an enormous log of timber that came from California over his road. It extends the length of three flat cars.

An improvement on injectors has been patented by Mr. W. B. Mack, inventor of the well-known injector bearing his name. The new improvements relate mostly to making the injector easy to take apart for cleaning and for the removal of scale.

The Brooks Locomotive Works at Dunkirk, N. Y., are busy finishing the order for twenty 17 × 24 ten-wheel locomotives for the Lake Shore and Michigan Southern Railway and are delivering them at the rate of one per day. During the past six months they have turned out 118 ocomotives.

The St. Charles Car Works have lately turned out seven teen beautiful chair cars for the Missouri, Kansas & Texas, that have excited much admiration among railroad men. The same company built within the month a complete train for the St. Louis & Hannibal, consisting of two elegant chair cars, a chair smoking car, baggage and mail car. The cars were furnished with consolidated system of steam heating and lighting. The chair cars have Scarrett's latest twin chairs.

We have received from the Baldwin Locomotive Works a photograph showing a part of the erecting shop in which are to be seen a number of compound locomotives in course of construction, most of them being for the Paulista Railway, of Brazil. One is a consolidation engine for the Western New York & Pennsylvania. We notice that there is a difference in the style of guides and cross head employed on this engine from what has previously been used on Baldwin compounds. The Baldwin people have just begun the erection of 17 compound locomotives for another railroad, of six different classes, and they have received orders for 12 more compounds of various types.

The State of Michigan has been fortunate in having sensible business men for railroad commissioners, and the legislature has been very wisely guided, in lawmaking respecting railroads, by the advice of the railroad commissioner. The legislature has lately been discussing the subject of safety appliances for railroads, and the following resolution was adopted: "That the Congress of the United States is hereby earnestly requested to enact such legislation as may be necessary to insure the adoption on all railroads in the United States of automatic couplers and train brakes, or such other legislation as may be necessary to insure the making up and running of trains without compelling railroad employees to enter between or on the tops of cars while the same are in motion."

The admirable paper on railway car lighting read by Mr. George Gibbs, of the Chicago, Milwaukee & St. Paul road, at the Western Railway Club, is so complete that it leaves but little to be said on the subject. One cannot but feel while reading it that the opinions there expressed are thoroughly without prejudice and that they represent the results of a most careful study of the whole problem. The opinions are not only without prejudice, but are also sound. It is needless to enlarge upon some of the conclusions arrived at, but there is one in particular to which we wish to refer. This is the possibilities inherent in the oil lamp. Some may not agree with the author of the paper on the question of the safety of such lamps, but it is a fact that unless they must be removed on account of legislative enactment, many cars will be lighted by them for years to come. We think that there are very few railroad officials who realize how excellent a light can be obtained from an oil lamp. Some of them are appreciating the fact, however, and we have several instances in mind of cars lighted by the most modern and approved form of lamp, and they compare with the ordinary coaches on the same line about as day compares with night. The use of such lamps of course means the burning of a larger amount of oil per car, but if the burner be what it should be it does not mean a greater expense per candle power, but rather the reverse. Whatever may be said against the oil lamp, these facts should be remembered and it should never be condemned on account of inability to give sufficient light.—*Railway Review.*

Some Recent Car Couplers.

As the scribe was sitting on the porch of his boarding-house trying to keep cool and brooding over the triumphs of mind over matter, the household milkman looked over his shoulder at the page of the *Patent Office Gazette*, and exclaimed, "Got a new attachment to a threshing machine there." The article pointed out has been depicted by our own artist in Fig. 1, and we felt proud to inform our

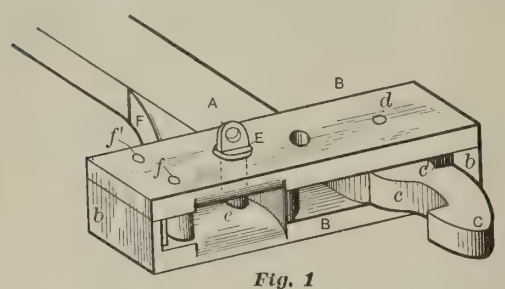


Fig. 1

rustic friend that the device he associated with the threshing of grain was intended to thresh the patience of railroad officers who would never consent to have it used as a car coupler, although Mr. Siebert Woodworth, a citizen of the United States, residing at Ellinwood, Kan., had sworn that it embraced new and useful improvements in car couplers, and had paid out the usual fees to the patent office to have the invention protected from the land sharks who feed by preference on car coupling stealings.

The milkman went his way, and the grocer's assistant was the next to impose his attention upon us. He is a shock-headed youth, with a proclivity for yellow-backed literature. "I know what that is," he exclaimed, dabbing a molasses-anointed finger upon the cut of the apparatus shown in Fig. 2. "That's a torpedo, the things they use for blowing the Chili man-of-wars higher than a kite."

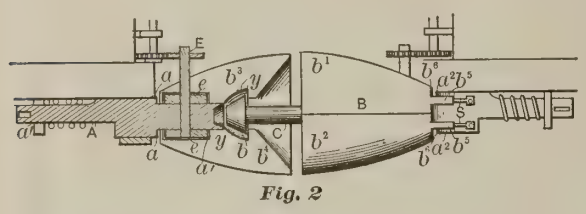


Fig. 2

The enlightening of grocers' apprentices respecting the high science of applied mechanics is not our vocation, and we did not deign to explain that the article belonged to gentle peace instead of truculent warfare. It may surprise many of our readers to learn that the cask-like apparatus was invented by Mr. David Bernard Croft, of Graysville, Va., as an automatic car coupler. A multitude of claims are made for it, that of novelty being the only one with a sure foundation. If the inventor ever substantiates the claim that a railroad manager has promised to use it for a car coupler there will be some railroad man a fit candidate for an insane asylum.

As we waded along through the record of inventions, we reached the device illustrated in fig. 3 and supposed it was a new bulldozer. But we were mistaken, for the description informed us that James McComb, William L. Hook, John McComb and Robert Gillespie had combined their inventive industry and produced the article shown as a car coupler. They claim that the invention combines simplicity and strength of construction with great convenience and effectiveness in use. It is sometimes pleasant for people to be strong in faith, for that is likely to be the greatest comfort the inventors ar deestined to derive from the patent. It will require long and persistent preaching to make railroad men see wherein the convenience and effectiveness of this car coupler lie.

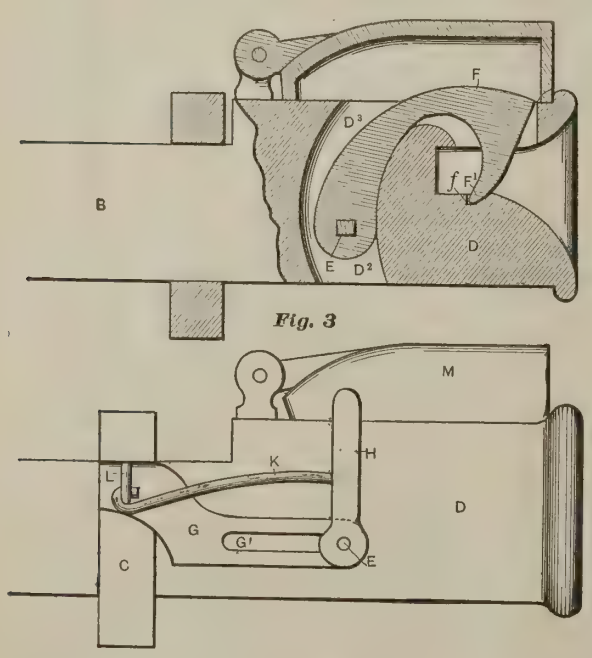


Fig. 3

Farther on we searched and our eyes were greeted with Fig. 4. This is an old friend that we had seen under several diverse forms at various exhibitions of railroad appliances, where it never failed to excite the derision of all

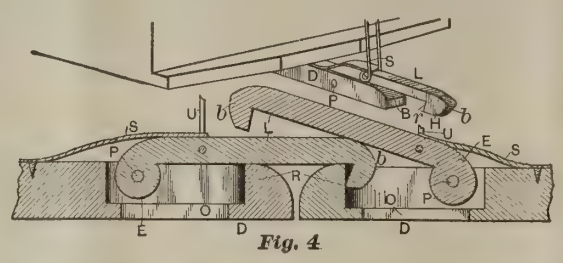


Fig. 4

men who had practical experience of keeping cars together. The luxury of paying for the patent papers on this particular design was enjoyed by George C. Collins, of Bolivar, Mo. Mr. Collins desires it to be understood that various changes in the details of construction and the sizes and arrangement of parts may be made without departing from the spirit of his invention, and that he reserves the right to incorporate these as fancy or experience may dictate. All right, George. Make your changes on the dictates of fancy for you will never get experience of the thing on cars unless you can buy them.

The next invention that arrested our attention was what we supposed to be a new valve motion for steam engines. Too many eccentrics, we remarked in confidence to ourselves, and then we proceeded to read the description of the device shown in Fig. 5, and found that it was also a

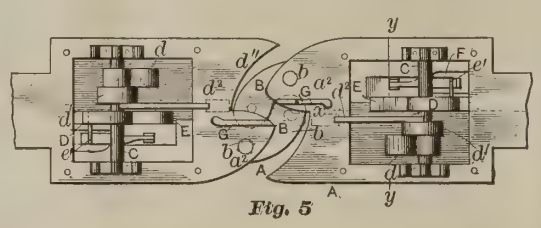


Fig. 5

brand new car coupler, the invention of Syrus Washington Wright, of Eden, Ala. We studied the apparatus very industriously for two hours with a view of mastering its exact method of operation. There was so much said about drawheads, locking pins, levers, arms, guides, operating wheels, pitman rods, fulcrumed levers, apertures, and other hard words, that having no dictionary at hand we relinquished the task, the only certain impression received being a headache. We were then contented with assurance of Syrus that by means of his invention two cars can be readily coupled automatically, and that the locking mechanism is easily operated.

We had thrown the number of the *Patent Office Gazette* down in weariness of spirit, resolved to look no more into its pages for the space of a day. The lady superintendent of our hash resort seated herself on the porch in the meantime, and, for lack of more enticing literature, took up the *Gazette*. After looking over the pictures for awhile, she turned and said: "Mr. Scribe, my coffee mill is always going wrong. I would like to get one like this," pointing at the engraving of Fig. 6. On looking over the descrip-

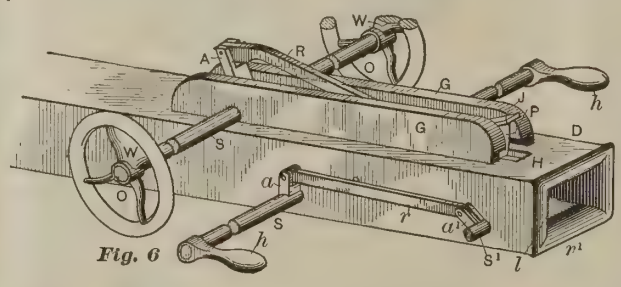


Fig. 6

tion we discovered that the invention was not a coffee grinder, but another car coupler which had been invented by a benevolent citizen of the United States, George W. Green, of Salem, Ohio, who was pleased to add a portion of his store of worldly greenbacks to the goodly pile already accumulated by Uncle Sam.

It is amusingto examine the absurdities of invention that are constantly revealed by the Patent Office records in the efforts to produce novel car couplers, but there is also a sad and serious side to the question. The car couplers illustrated are all taken from one copy of the *Patent Office Gazette*, and fifty-two numbers come out every year. With these for one week it is easy to imagine the aggregate for a year. There appears to be an insane belief among certain persons that if they can devise a so-called car coupler which can be patented they will have something worth selling. The articles are not designed with a view of making a device that will be a better car coupler than anything else previously invented, but to make something patentable. All the couplers shown depart radically from the element of simplicity which is of the first consequence in a car coupler. Most of them are evidently gotten up by men who have no conception of the rough service which a car coupler has to endure. The inventors are also evidently ignorant of the fact that the vertical plane type of coupler is a standard of the Master Car Builders' Association, and the only patented form that railroad men can afford to consider. We can see men mortgaging their small homes and spending the last cent they can raise to pay patent fees on car couplers that no railroad manager would dare put on a car. This is a sad picture, but it is too true, and in all kindness we would urge men who contemplating the patenting of car couplers that are not improvements on the standard type to throw the models and drawings in the fire.

The contract for laying the Third avenue cable line in New York City is in the exclusive hands of William Wharton, Jr., & Co., of Philadelphia. This firm built the Market street cable line in that city, and have built numerous other lines in many Western cities. They own their rolling mills, a Bessemer steel plant, etc., and furnish all the material as well as performing all the work of construction. The contract calls for nearly eight miles of double track, making with the switches at the uptown terminus about 16 miles in all. The track work proper is completed from 100th street to 116th street, and in the course of a week or two will be begun at the upper end of the Bowery.

The Counsel of Ignorance.

During the discussion on compound locomotives in the Master Mechanics' Convention some remarks were made that throw light on the incompetent manner the investigations are made by the Franklin Institute respecting inventions that are under consideration for the awards for merit granted by that institution. The awarding of the Elliott Crescent Gold Medal for the best compound locomotive was under consideration and the inclination of most of the members was to grant it to the Vauclain locomotive, but some opposition was raised. At this juncture Mr. Thomas Shaw came to the rescue and helped to settle the matter. In the convention he told that he rode on the engine during a trip on the Reading Railroad pulling a very heavy train, and he was so much pleased with the working of the engine that he submitted a report to the general committee of the Franklin Institute that settled the matter, and the medal was awarded to the engine. Speaking of the heavy work done by the engine Mr. Shaw said that the grade is so heavy that ordinary locomotives will not bear to have water put in the boilers, that the engineers load up their engines with water and avoid putting the injector on.

Mr. Lauder questioned the accuracy of the statement made, and Mr. Shaw called upon Mr. Paxson to corroborate what had been said. It turned out that the engines would not stand firing on that particular grade, and Mr. Shaw had to admit that he misunderstood the matter. Yet a man who knew so little about the practical working of a locomotive that he imagined an engine pulling a heavy train could go up a long grade without feeding the boiler, was welcomed to give decisive advice respecting the merits of a locomotive.

Production of Steel and Pig Iron.

The Bulletin of the Iron and Steel Association contains statistics of the production of pig iron and Bessemer steel for the first half of this year. Of pig iron the total production was 3,371,925 gross tons, as against 4,560,513 gross tons in the first half of 1890, a decrease of 1,188,588 gross tons, or 26 per cent. The decline affected the pig-iron producing States very unequally. Some States increased their production in the first half of 1891 as compared with the first half of 1890. The States that did so were Massachusetts, Connecticut, Georgia, Texas, Michigan and Colorado. Four of these States produce only charcoal pig iron. The production of Pennsylvania, Ohio, Illinois, Alabama, Missouri, New York, West Virginia, Wisconsin, Virginia, Maryland, New Jersey, Kentucky, Indiana, Oregon and North Carolina was reduced. Tennessee nearly maintained her record, producing in the first half of 1891 within 1,483 net tons of her production in the first half of 1890.

The reduction in anthracite and mixed anthracite and coke pig iron in the first half of 1891 was 17.2 per cent.; in unmixed coke and raw bituminous pig iron 30.8 per cent. and in charcoal pig iron 6 per cent. The reduction in Bessemer pig iron was 32.8 per cent.

The production of pig iron in the nine Southern States in the first half of 1891 as compared with the first half of 1890 shows a falling off amounting to 17.5 per cent.

The shrinkage in the production of Bessemer-steel ingots in the first half of 1891 as compared with the first half of 1890 was over 21 per cent., while the shrinkage in the production of Bessemer-steel rails in the same period was nearly 44 per cent. These are very great shrinkages. The wide gap between them, however, again illustrates the growing popularity of Bessemer steel in the production of articles other than rails. The production of Bessemer steel rails in the first half of 1891 was the smallest half-yearly production that has taken place since the first half of 1885. It was even smaller than in the second half of that particularly dull year. The reduction in the ingot production in the first half of 1891 as compared with the first half of 1890 was wholly due to the decreased demand for rails.

Mackenzie's Locomotive Boiler.

The annexed engravings illustrate a form of boiler that has been designed by Mr. John Mackenzie, Superintendent of Motive Power of the New York, Chicago & St. Louis. Among the principal advantages claimed for this design of boiler is the substitution of a coned sheet between the wagon-top and barrel of the boiler, for segment sheets that have been used heretofore, thereby giving the benefit of a wagon-top boiler, which has not been done heretofore without the use of segment sheets, or, in other words, they succeed in accomplishing with one sheet what has been done heretofore with five sheets in this kind of boiler. The boiler, as may be observed, has but two rings or sheets from the arch to connection with firebox and throat sheet. By making the boiler in this way they have a true circle at the back end and show no depression at the connection with throat sheet. The diameter of the boiler at front end is 52 inches. With this form of a 52-inch barrel a much larger back end of boiler can be had, thereby increasing the firebox area and spreading flues, which designers have not been able to do in the wagon-top boiler.

The change in the small ring, or barrel rather, in the front end keeps the weight from the trucks, and places the large heating surface and heavy part of the boiler where it is most desirable. They spread the flues in the front end, for the purpose of taking up all the available water space between flues.

The New York, Chicago & St. Louis have 11 engines running with this class of boiler, and are getting excellent results so far as steaming qualities are concerned and the cleanliness of crown sheet. One of these boilers has been running over a year, and in that time has made over 60,000 miles, and the crown sheet is about as clean as when it was first put in.

The following are the specifications used in the building of these boilers, which are intended to carry 160 pounds working pressure, or more if necessary.

Material of sheets throughout boiler, Otis steel, $\frac{5}{16}$ inch, $\frac{3}{8}$ inch, $\frac{1}{2}$ inch, $\frac{7}{16}$ inch, $\frac{9}{16}$ inch, thickness.

Tubes, 202 in number, $2\frac{5}{8}$ inches and $2\frac{1}{4}$ inches pitch, 11 feet $5\frac{1}{8}$ inches long, of charcoal iron No. 13, wire gauge (B. W. G.), with copper ferrules on swaged ends in firebox tube sheet.

Firebox, $33\frac{7}{8}$ inches × 78 inches inside, crown sheet, supported by radial staybolts of double-refined iron, 1 inch in diameter in crown sheet and $1\frac{1}{16}$ inch in diameter in roof of boiler; each staybolt in six center rows, running longitudinal of firebox, to receive one nut of $\frac{5}{8}$ inch thickness under crown sheet, as shown; sides, door and tube sheets stayed by $\frac{7}{8}$ staybolts of double-refined iron; tube sheet additionally stayed by throat stays; end of each throat stay placed $3\frac{1}{8}$ inches from flue sheet and secured thereto by $\frac{7}{8}$ staybolt as shown; staybolt screwed through tube sheet and firmly bottoming in throat stay, then riveted over on tube sheet.

All radial staybolts must have full thread, 12 threads per inch, carefully screwed through each sheet and riveted over on ends, and those with nuts to be riveted over outside of nut.

First row down and above longitudinal seam in firebox, shown by letters *A* and *B*, drilled from both ends, $\frac{1}{8}$ inch hole, $\frac{3}{4}$ inch deep.

All longitudinal seams in shell, triple riveted; circumferential seams between conical course and first course, and conical course and wagon top, outside sheets and throat sheet double riveted.

All rivet holes to be punched from the side of the plate on which the head of the rivet is to rest. All holes for rivets $\frac{1}{8}$ inch greater in diameter than the rivet.

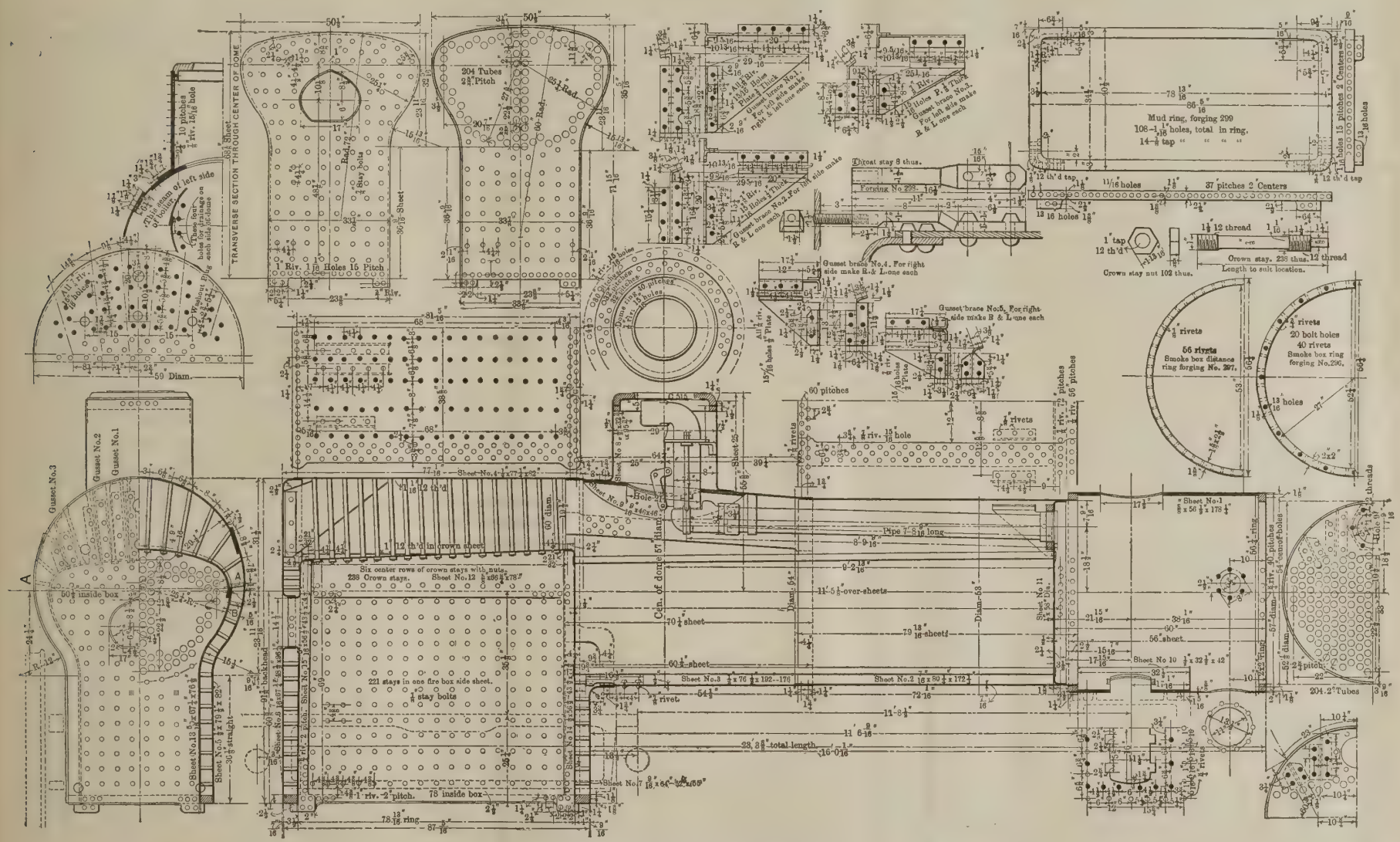
Firebox mud ring secured with 1-inch rivets in body of ring and with $\frac{3}{4}$-inch rivets in the extended corners as shown.

All plates planed at edges and calked with round-pointed calking tool, insuring plates against injury by chipping and calking with sharp-edged tools.

Cleaning plugs in each corner of water leg of firebox and three in back head to wash crown sheet, as shown.

All flanged sheets thoroughly annealed after flanging.

Boiler to be constructed and finished in a workmanlike manner and subject to such inspection and tests as this company may choose to make.



MACKENZIE'S LOCOMOTIVE BOILER.

Contour Gauges.

In the report of the executive committee of the Master Car Builders' Association on the maintenance of coupler standards, our readers will remember that they recommended the use of several gauges by which to maintain the proper contour and the main dimensions. In looking over those gauges which refer to the contour lines it will be noticed that there is one point of importance which has been entirely omitted in the considerations of the committee. This is the gauging of the entire contour lines. The templates, as suggested, only provide for the gauging of that portion of the contour lines which is inclosed between the inner face of the knuckle and the guard arm of the coupler; or, in other words, the pocket (so to speak) into which the opposing coupler hook is engaged. Besides this there is a gauge for determining the thickness of the end of the knuckle at the point where it measures practically three inches across. No means, however, have been provided for gauging what is usually termed the heel of the knuckle, or that part which comes in contact with the guard arm of the opposing coupler, and yet the contour of the guard arm is carefully gauged.

This being the case, it seems rather strange that the gauging of the heel of the knuckle should have been omitted, as one is just as important as the other. In addition to this, the template or gauge as suggested by the committee permits of very inaccurate application. For instance, if the continuity of the contour line should be broken at the outer end of the knuckle, the two portions of the lines could be made to assume any relation to each other without this gauge recording such inaccuracies. It gauges only about one-half of the coupler contour, and it gauges that entirely independently of the other half. If, therefore, a complement of this gauge were made for the other half of the contour, and each gauge be applied independently, the lines could still be very much distorted, because their continuity at the point where the two half gauges met would be a matter of doubt.

It must be confessed, therefore, that the gauges as presented in this report last June are entirely inadequate for the work which they are expected to do. We are glad to state that this error has already been noticed by the executive committee, and that they are going over the matter in a most thorough manner, the result being that the gauges as finally sent out by them will doubtless be suitable for properly gauging the contour lines. We do not desire to anticipate the action of the executive committee, and will therefore simply state that the gauges will be made to test the entire contour, and will also be made so as to more readily gauge variations from the contour lines within the limits allowed by the report of the committee. Much good work has been done upon the gauges since the June convention, and when they finally appear we think that those who have to use them will be very much pleased with their construction.—*Railway Review.*

An electric power hammer has been devised which represents a radically new application of electro-magnetic principles. In general design the hammer is similar to the steam hammer, with its vertical cylinder mounted upon an arched frame, and the rising and falling piston by which the hammer head is carried. The novelty of the apparatus lies in the substitution of electro-magnetic power for steam by a slight and very simple modification of the mechanism. The piston is of magnetic material, and the cylinder is composed of a series of coils, through each of which an electric current may be passed separately. The apparatus is virtually an immense electro-magnet, the cylinder being the coil and the piston answering to the core. The passage of an electric current through the coils forming the upper part of the cylinder raises the piston into the magnetic field thus created. By cutting off the current and simultaneously transferring it to the lower coils of the cylinder the piston is released, and its descent is accelerated by the magnetic attraction created below. As a magnetic field can be created in any of the series of coils, the blow may readily be shortened or lengthened as desired. The current is controlled by levers and connections identical with those used on an ordinary steam hammer. The absence of the steam pipe is the only feature distinguishing the machine from the common steam hammer. A modification of this apparatus has been for some time used successfully as a rock drill.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

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KEEPING BOILERS CLEAN.

We do not remember ever having read a report submitted to the mechanical associations whose sentiments and conclusions we so thoroughly dissent from as those embraced in the report read at the last Master Mechanics' Convention on the "Purification or Softening of Feed Water." One of the greatest difficulties encountered by those responsible for the economical operation of motive power on the greater part of our railroad systems is the preventing of the heating surfaces from getting prematurely destroyed by scale and mud deposited from impure feed water. The evil is so widespread that everybody is familiar with it. The Master Mechanics' Association has taken a leading part in spreading information about feed-water impurities and the effects of incrustation in boilers, for reports have been read on the subject at seven or eight conventions, and several papers have been presented by scientists, yet the matter of devising a remedy is an unsettled problem. None of the previous committees or the scientists who investigated the subject have displayed such a hopeless or helpless tone as the last committee. The practice has been to investigate the cause and extent of the evil, and then recommend the application of the best-known remedies. This time the report turned mostly on telling of the failures that had occurred among those who attempted to neutralize the evil effects of hard water by chemical and mechanical agencies.

The cause of hard feed water is easily understood, but the application of an effective remedy requires skill, intelligence and unyielding perseverance. Throughout the greater part of the North American continent limestone rocks are abundant. There are several other minerals that dissolve in water and form scale in boilers or corrode the metal of the boiler, but at least 99 per cent. of the trouble experienced with boilers arises from the presence of lime salts in the feed water. This being the case, any chemical or mechanical means that can be applied successfully to neutralizing the destructive tendency of lime will lengthen the life of boilers and make the fuel used more effective. If a piece of limestone is placed in chemically pure water it may remain for months without dissolving, but if a touch of certain acids is added to the water the lime readily dissolves. The rain water that falls from the clouds contains a small quantity of carbonic acid which acts on the limestones touched and dissolves them, forming carbonate of lime. Sulphur is a widespread mineral, and wherever it is found exposed to the air, it combines with oxygen and forms sulphuric acid. This acid has a great liking for lime, and when they come together they form sulphate of lime. The two substances mentioned, carbonate of lime and sulphate of lime, are the principal scale formers in feed water. The problem that so many railroad men and other steam users are trying to solve is the capturing of these lime salts before they are deposited on the heating surfaces.

The measures of remedy usually followed are to put compounds in the feed water which precipitate the lime, and to provide the means of removing the solid matter without letting it adhere to the hot plates. There are certain compounds which have a greater affinity than lime for sulphuric acid and for carbonic acid. As these acids keep the lime in the water dissolved, their capture permits the lime to become a solid when it settles in the form of mud. Hard waters that contain a large percentage of carbonate of lime have been softened systematically by adding caustic lime. This is known as the Clark process, and by it 28 grains of caustic lime precipitate 100 grains of carbonate of lime. Water containing sulphate of lime may be purified by the use of caustic soda, and this substance can be applied successfully to water containing both sulphates and carbonates of lime. This is, in fact, the remedy in use on the Chicago, Milwaukee & St. Paul, and it works well on most of the mixed lime waters to be found west of the Alleghenies. Why it will not work with the water on most other roads is that it requires constant attention. The remedy will not operate itself on the wholesale plan. There is no use sending a ton of it to every water station and letting it remain there. That will do no good. It must be put in the tenders of the engines regularly, and the blow-off cock or an improved equivalent used to remove from the boiler the lime separated from the water by the compound.

The experience reported with appliances and compounds for purifying feed water would lead to the belief that the laws of nature worked differently at different times and places. A chemist or the agent for a purifying compound examines the feed water of a division, and estimates that by putting in a certain quantity of a chemical in the tender every time it is filled, the lime in the feed water will be dissolved so that it may be blown out. There has been grief and wailing at headquarters about the amount of boiler work called for, and all in authority are worked up to strive for a remedy in doctoring the feed water. When the chemical is first introduced it is tried on one engine, and care is taken that the proper quantity is mixed with the water at every water station, and the engineer is kept informed that he must use the blow-off cock regularly. The engine runs two months without washing out and on examination is found to have a fairly clean boiler. The thing is declared a success and vigilance is relaxed. The supply of the chemical becomes fluctuating and uncertain, little attention is directed to the blow-off cock, and the boiler needs to be washed out as regularly and as often as the others. A year or two afterward inquiries are instituted as to how the boiler compound worked, and the answer received is that it did fairly well at first, but after being used for a time it ceased to do any good. With slight changes the same is the kind of experience with mechanical purifiers. There are no doubt compounds and mechanical purifiers that are humbugs, but if one or the other, while under vigilant supervision, materially increased the mileage that could be made between washing out, the final failure was due to the carelessness or apathy of those in charge.

HOT BOXES.

In the course of a short trip over a railroad by no means noted for heavy cars or for making fast time when running, we rode on two trains that lost time on account of hot boxes. There was a time when one could scarcely make a trip on any railroad without meeting with delays from hot boxes, but there hus been comparatively little trouble of this kind for some years, and inquiry was made as to the prevalence of hot boxes in the case referred to. There was great diversity of opinion among the car men as to the cause, but it was evident that hot boxes were common enough to engender considerable hard feeling between the car department and the operating officers. The head of the car department attributed the prevalence of hot boxes to carelessness in oiling, and he had a good deal to say about the difficulty of finding reliable men nowadays for attending to cars at inspection points. He was also disposed to blame the purchasing department for the inferior quality of the oil supplied. When another man belonging to the car department was questioned about his views on hot boxes, he was ready to prove that hard brass was the secret of all the difficulty. To corroborate his views he produced a brass taken out of a hot box, and the surface of the bearing had a dark polished appearance, but the surface was not cut in the least. This was supposed to be proof positive that the brass was too hard. Another man who ought to know something about the car matters on the road insisted that badly designed trucks were to blame for the number of hot boxes reported. The trucks were so constructed that the equalizers did not transfer the weight evenly above the bearings. Too much weight rested on the inside part of the bearing and it resulted in wearing the inside portion of the brass much more rapidly than the outside, a fact he proved by leading the writer to the brass scrap heap, where the old bearings were found just as he described.

There is a popular belief that an onlooker at a game of chess can grip the whole details of the contest better than the players because he is not bound up in any particular line of movement. An onlooker can likewise sometimes see the exact facts in a case of difficulty on a railroad better than the participants, because it is not his own trouble and he can consider all particulars dispassionately. From the look of the boxes we were inclined to believe that inferior packing was more to blame than bad oil. The kind of packing and the manner it was applied would account for the inside of the brasses wearing. The company make their own bearings and they very seldom buy any new copper or tin, so it is likely enough that bad metal had something to do in causing hot boxes. We do not think there is any economy of collecting all sorts of cheap scrap brass to make passenger car bearings from. It is the familiar practice of making great fuss in stopping up the spigot and at the same time opening the bung hole.

Shortly after returning from the journey where the hot-box question had been revived the impressions received were sustained by the experience of another railroad. The writer asked the superintendent of motive power of a prominent trunk line if his people had any trouble with hot boxes. "No,'" was the answer, "I am enjoying for the last six months the greatest pleasure experienced since I took this position, for we have got rid of the constant harassing worry that used always to be with us concerning hot boxes. A hot box on one of our passenger trains," he continued, "is a thing of the past, as rare as it used to be to get a through train over the road without delay from that cause, and all that was done to bring about this gratifying state of affairs was the adopting of journal-box packing that keeps the oil up to the journal." This was a confession which is well worthy of serious attention from those who are still tortured with hot boxes and are investigating remote and complex defects on the supposition that the cause of the trouble is difficult to determine. The journal bearing of a heavy car endures a tremendous pressure per square inch of the surface, and it is often pretty close to the heating point when well lubricated. If the oil fails to reach it for a few miles nothing nothing less than a hot box can be expected. When a journal has once been roughened by running hot it is liable to give help in keeping up the record of the road for hot boxes. There are probably cases where inferior lubricants are to blame for the constant trouble from hot boxes, but there is no excuse for this, since it is an easy matter testing the efficiency of a lubricant. We lately heard of a railroad company whose officers boasted for years about the cheapness of the oil used, and kept on with it in spite of much tribulation from hot boxes. A new manager got investigating the matter, and discovered that the quantity of cooling compound used up during a year raised the price of lubricants to that of high class oil. A better quality of oil was ordered, and cooling compounds were no longer in demand, for hot boxes were remedied. Common sense is a good quality to put to work in finding out the best cure for hot boxes.

EDUCATION OF LOCOMOTIVE ENGINEERS.

"There are cases where the small displace the great," said one of the brightest members of the Railway Master Mechanics' Association, when he was asked why the convention at Cape May did not discuss the report on Examination of Locomotive Engineers and Firemen. It is very much to be regretted that this report was not discussed, for it relates to a question that is of much greater importance to railroad companies than most of the subjects that monopolize the attention of the mechanical associations. If anything had been said or done at the convention that would tend to spread education respecting their work among the enginemen of the country, it would have been of greater benefit to railroad companies financially than all the talk or action on other subjects. The men who are striving to reduce the expenses of operating locomotives are looking hopefully to the saving in fuel bills that may be effected by the introducing of compound locomotives, and it will represent a large aggregate if they can save 10 per cent. This is progress in the right direction, but we are satisfied that on many railroads a saving of 25 per cent. could easily be accomplished by merely interesting the enginemen in fuel saving, and by showing them how saving could be accomplished.

We frequently hear master mechanics scolding about the apathy of their enginemen who display no inclination to improve themselves on the science of their business; but it is not the enginemen who are to blame; it is the men who select them in the first place and then permit them to grow old in ignorance, without making an effort to call for knowledge, or to encourage its cultivation. There is no true foundation to the complaint frequently repeated that good material for firemen cannot be found nowadays. There is very often the very worst material employed, but the blame is entirely with those that do the selecting. On one road we find all the young firemen bright, intelligent, respectable young men who would be a credit to any business, and who will grow up to be first-class engineers, masters of their business. On another road, with head-quarters in the same district, we find that the bulk of the firemen rank in intelligence and intellectual training with the track laborer, and the extent of a fireman's aspirations are to reach the right hand side by strict force of advance by rotation. What is the secret of this difference? Merely the difference in selection. The master mechanic or superintendent, who advances men by mere seniority without a test of knowledge and skill, is putting a premium on ignorance and is stocking his road with engineers who will always do the work in the most expensive way.

In the report on operating locomotives with different crews, and in the discussion that followed the reading of the report, considerable was said about the special provisions that ought to be made for the inspection and care of engines that were in the hands of different men. That was right and proper, but nothing was mentioned about the pernicious influence on young enginemen of the practice of holding no man responsible for the welfare of a particular engine. When a young man goes firing and follows the same engine he spends considerable time every week in the engine-house cleaning and doing work that brings him in contact with repairing operations. He has an interest in his engine, and naturally watches how repairs are effected and gradually becomes familiar with the way parts are put together and the purpose of their design. This is an important part of the training that qualifies the fireman for promotion as an engineer. With the chain-gang system, the most valuable part of this training is lost. A man has no incentive to spend his time in the engine house. He seldom has any duties there, for he is not required to do anything until he is called to go out, and then the engine is ready for the road. The tendency of locomotive construction is to make every part in such shape that it shall require no work from the engineer on the road, consequently the fireman seldom sees even ordinary adjustments made. A man may follow for four or five years the life of a fireman on a chain-ganging road and at the end of that time know less about his business than a bright fireman might learn in two months under the old system. An intelligent man determined to learn will make it his business to go after the information and training required, but the average man is not made of this material, and it is the duty of the officers responsible for the selecting of efficient enginemen, to see that incentives and opportunities are given for firemen to acquire the skill and knowledge that will make them safe and profitable engineers.

THE BASIC STEEL PROCESS.

During the interesting discussion in the Master Mechanics' Convention on "the critical temperature of steel and iron," some of the speakers referred to basic steel in a way which gave the impression that by that process of steel making the product acquired some valuable characteristics not possessed by steel made by the common process. This is a mistake. The aim of those who make steel by the basic process is to produce from inferior ores a metal that is as free from impurities as the steel made by the acid process from irons selected for their purity. In the making of steel by the ordinary Bessemer process, a charge of molten pig iron is put in a pear-shaped vessel called a converter, and through this mass a strong hot blast of atmospheric air is blown which burns the extra carbon and several other impurities out of the pig iron, but leaves the phosphorus and sulphur. As the commoner kind of iron ores contain about two per cent. of phosphorus and 0.2 per cent. of sulphur, and steel for rail making must not have more than 0.06 per cent. of phosphorus and 0.03 per cent. of sulphur, pig iron made from selected ore has to be used for the ordinary Bessemer process of steel making. In this country it has not been difficult to obtain pig iron sufficiently free from phosphorus and sulphur for steel making at a moderate price, but in several of the iron districts of England and Germany, ores suitable for steel making had to be brought from long distances. In order to make use of the inferior ores, a Welsh and a Scotch metallurgical chemist, named Thomas and Gilchrist, invented a method by which phosphorus and sulphur can be eliminated from the charge in the converter. The ordinary converter is lined with ganister, a refractory mixture, consisting mostly of silica, which is an acid, like phosphorus and sulphur, and has no affinity for combining with them at high temperatures, as the tendency of elementary substances is for acids to combine with bases—the unlikes mixing together to form new compounds. The invention of Thomas and Gilchrist consisted of lining the converter with a basic mixture, principally dolomite, the elements of which are calcium and magnesium. At the high converter temperature, the phosphorus and sulphur combine with the calcium and magnesium, leaving a metal fairly free from these objectionable hardeners. The process of steel making in this way is not so convenient as that by the so-called acid or ganister lining process, for the converter linings are hard to keep in repair, and there is difficulty in clearing out the hard and tough slag formed by the chemical combinations that have taken place. If selected ores are used to produce Bessemer steel by the acid process that has a certain low percentage of phosphorus and sulphur, there will be no difference in the quality of steel made by the basic process that contains the same percentage of the impurities named.

A modification of this basic system has lately been applied to open-hearth furnaces, a lining of basic material being used on the bed of the furnace. By conducting the open-hearth processes upon such a lining, with the addition at short intervals of a small proportion of lime and iron ore to the charge, a highly phosphoric and basic slag is produced during the working, which, owing to the excess of lime present, removes the silicon completely and the phosphorus almost entirely. If the process is carefully conducted the product is a steel with very little phosphorus in it. The best open-hearth steel produced by the basic process is, however, no better nor less free from phosphorus and sulphur than the Otis or Shoenberger steel, which is made by the acid process from carefully selected iron.

LIQUID FUEL FOR LOCOMOTIVES.

The letter in another column from Mr. C. L. Dunbar, Callao, Peru, on the burning of liquid fuel in the locomotives working on Peruvian railroads will be read with interest by all our readers interested in the generation of steam. It will be seen that some original features have been introduced by the engineers who designed the oil-burning apparatus for the Peruvian locomotives, features that would be well worthy of imitation by others working on the problem of using liquid fuel for railroad motive power. We have no doubt but the success of these locomotives will lead to the use of the same kind of fuel for other countries in South America where coal is very expensive.

Copious oil deposits have been found in Argentine, and in smaller quantities in Brazil, so it is likely that oil will be the future fuel for the railroads in the whole of South America. Some of the railroads in Argentine are using what is known as Holden's method of burning oil in locomotive fire-boxes, and the same system has been applied to a limited extent on the State railways in India. Very little change is required in the fire-box of a locomotive to adapt it to burning liquid fuel on the Holden system. On the grate there is always a fire, partly of coal, but generally of a large part of limestone in small lumps or of broken firebrick. The oil passes through the nozzle of the injector at a great pressure, but very little of it falls on the limestone or firebrick fire, as the temperature is so high that it is burnt up quickly, and none of it passes to the ashpit below. The materials on the grate seldom require replenishing, as the oil is sufficient for the purpose. From some experiments which were recently made in India with a train of twelve carriages on a run of 1,200 miles, it was found that the consumption of petroleum, coal and wood was at the rate of 22 pounds per mile, while a similar engine, using coal alone, doing exactly the same work, needed 50 per cent. more fuel.

CAR LUBRICATION.

"Car Lubrication" is the title of a small book by Mr. W. E. Hall, assistant master mechanic of the Altoona shops of the Pennsylvania Railroad, published by John Wiley & Sons, New York. The author has evidently had considerable experience in laboratory work, and has used the information collected there to practical car lubrication, for the book indicates that he is thoroughly familiar with the subject theoretically and practically. There is scarcely any literature of a practical character on the lubrication of railroad rolling stock, and this book will be very welcome to those who are interested in the subject.

Briefly stated, the treatise discusses the laws of friction, with the immediate relation they exert upon lubricated surfaces of loaded car journals. The author, like nearly all recent writers on friction, discredits the old theory that the resistance of friction is independent of the area of surface in contact, but dependent upon the pressure. Practice and experiment have demonstrated that with the friction of rotation an increase in the diameter of the journal means a corresponding increase in the work of friction. When the rubbing surfaces are kept well separated by the lubricant, friction is more dependent upon the nature and fluidity of the lubricant than upon the nature of the solids carrying the load. As unnecessary frictional resistance and abrasion of rubbing surfaces represent waste of money for railroad companies, the object of the book is made to show how that can best be avoided. The problems of car lubrication are treated under the heads, theoretical relations, coefficient of friction, bearing metals, methods of lubrication, journal-box construction, cost of lubrication, and heated journals. Those interested in keeping journals running cool at the lowest cost will find points in this book that are well worthy of consideration.

ROLLER ANTI-FRICTION JOURNAL BEARINGS.

A correspondent writes us saying that he had been greatly interested in a heavy passenger car that is carried by anti-friction roller bearings that move so easily that one man could move the car without difficulty. This, says our correspondent, is absolute proof that the resistance to movement is greatly reduced by the use of roller bearings, and no oil is required for the boxes. Now, he asks, with some show of indignation, why are railroad companies so blind to their own interests that they do not adopt this great improvement at once, since one locomotive ought to be able to pull three or four times the number of these cars that they can handle of ordinary cars?

Roller bearings are not such a novelty as they appear to be to the younger generation of railroad men, and the saving in train resistance is only in the start, and the resistance is said to be greater than that of ordinary cars when speed over thirty miles an hour is reached. We think great advantage could be derived from using a good roller bearing under street cars, transfer tables and other places where the velocity of revolution is comparatively slow, but we should not like to advise a railroad company to place them under express cars.

Anti-friction roller bearings was one of the first inventions designed by an American as an improvement on railroad cars, and they have been tried in a great many different forms ever since. All the older master car builders have had experience with roller bearing patentees. About 1830 Mr. Ross Winans, of Baltimore, invented a roller bearing, and it was at first regarded as the greatest invention of the age. Calculations were made that it reduced the resistance to movement 80 per cent. So satisfied were Mr. Winans and his friends that there were millions in the invention, that they determined to take it to England, where a greater railway field was open than anywhere else. Some of the officials of the Liverpool & Manchester Railway were wonderfully pleased with the device, and offered to adopt it after making some tests which some astute engineer suggested. Accordingly a car fitted up with the bearing was placed on a steep grade alongside of an ordinary car, and the two were started together. The roller bearing car took an easy lead at first, but after a speed of about 20 miles was reached the common car began to gain on the other, and before the foot of the grade was reached it was far ahead. Winans readily understood the cause of failure, and wasted no energy in trying to do more with friction roller bearing. Others have not been so sagacious.

FORCED DRAFT.

Forced draft by means of air pressure under the grates instead of suction above them has for the last few years been making great headway among torpedo boats and other vessels where, on account of limited room, small boilers are used that must be forced to their utmost capacity. Predictions have been freely made by engineers that this mode of creating forced draft would eventually be generally applied to locomotives, and it is possible that the change may be made. There have been two ways tried on steamers for controlling the air pressure necessary. One plan is to make the ash pit air-tight, except at the grates, and put it in connection with the passage from an air-forcing fan; the other way is to have the whole of the stokehole air-tight and have the firemen and others working under a compressed atmosphere. This plan has been adopted on several large ocean steamers, the total draft required being obtained partly by the suction of the smoke-stacks and partly by the pressure in the stokehole. When the City of Paris was undergoing repairs, a change was made from air pressure in the whole stokehole to pressure in the ash pits, but this has not been an improvement, for the boilers have not supplied the same amount of steam since the alterations were made and the owners are reported to be considering the propriety of inclosing the entire stokehole again.

The first locomotives that were used on the Baltimore & Ohio were operated by forced draft created by a fan, and there was no objection to the plan except that the fan-driving mechanism was in the habit of getting out of working order. With the improved mechanism of the present day, there ought to be no difficulty on this score. If the use of the exhaust steam for making draft could be dispensed with, the locomotive could be made more efficient, since back pressure in the cylinders could be almost entirely eliminated. When the compound locomotive gets better developed, it may be that the creating of draft by the exhaust steam will be found even more objectionable than it is with simple engines. In that case forced draft by fan pressure may be resorted to.

RESERVE INSTEAD OF EXCESS PRESSURE.

In some notes on air-brake matters by Mr. George Holmes, to be found in another part of this paper, a suggestion is made to change the expression excess pressure to reserve pressure, and we think the change is well worthy of adoption. There are many of the engineers handling the air-brake who have exceedingly incorrect ideas about the apparatus. They know how to turn the value handles to apply and release the brake, and they can tell when the air-pump is working smoothly, and that is about the limit of their accurate knowledge. Most of them, however, are familiar enough with the English language to know that excess means more than enough, and many of them have heard that the sliding of wheels has been caused by excessive air-pressure. We have the authority of Brother Forney for saying that most of men are very poor reasoners, and it may be on this account that many locomotive engineers associate excess pressure with the sliding of wheels. Be this as it may, there are numerous roads on which the engineers never run with the engineer's valve handle in the position to hold the excess of air, and when the men are questioned as to why they do not follow the proper practice they talk vaguely about the sliding of wheels. This indicates that there is a prevailing misunderstanding on the subject. To call the pressure held for releasing purposes reserve, would be giving it the proper name, and we feel assured that should the change be made it would result in an improvement in the handling of the air brake.

Personal.

Mr. R. A. Parke, eastern agent of the Westinghouse air brake, was married last month.

Mr. F. H. Soule has been appointed general car inspector of the Lake Shore & Michigan Southern.

Mr. H. Walters, for many years general manager of the Atlantic Coast Line system, has resigned.

Mr. E. B. Thomas, first vice-president of the Erie, went to Europe last month to be absent six weeks.

Mr. H. C. Morgan, superintendent of the Savannah terminals of the Central of Georgia, has resigned.

Mr. W. N. Marshall, general superintendent of the Savannah, Americus & Montgomery, has resigned.

Mr. W. T. Wilcox has been appointed master mechanic of the Charleston, Cincinnati & Chicago Railroad.

Mr. C. J. Cooper has been appointed master mechanic of the Toledo, Columbus & Cincinnati shops at Kenton, Ohio.

Mr. George N. Dow has been appointed division master car builder of the Lake Shore & Michigan Southern at Cleveland.

Mr. M. L. Hinman, vice-president of the Brooks Locomotive Works, Dunkirk, N. Y., has been elected president of the Lake Shore National Bank, of Dunkirk.

Mr. Arthur G. Leonard, assistant to Vice-President Webb, of the New York Central, who has been sick for two months, has recovered and is back to work.

Mr. Frank E. Shaw, vice-president of the Martin Car Heating Company, at Dunkirk, N. Y., has been elected president of the Lee Composite Company, New York.

Mr. O. W. Meysenburg, president of the French Car Company, has gone on a visit to Europe along with his friend Mr. Van Horn, president of the Canadian Pacific.

Mr. J. C. Homer, for eight years master mechanic of the Ohio & Northwestern Railroad, has left to accept the position of superintendent of the Howell Wheel Company, Covington, Ky.

Mr. W. T. Hogan, master car and locomotive painter of the Atchison, Topeka & Santa Fe, has resigned. Mr. Hogan is well known among railroad painters to be one of the ablest men in his line.

Mr. N. S. Possons, formerly superintendent of the Brush Electric Company, has been engaged by the Eureka Tempered Copper Company, North East Pennsylvania, to act as general sales agent.

The *Phonographic World* publishes a very good portrait and biographical notice of Mr. L. E. Waterman, inventor of the well-known fountain pen, who was for several years traveling agent for the National Car Builder.

Mr. Harvey Rice, who ran the first locomotive on the Concord Railroad when the road was opened, in 1842, died last month at the age of 79 years. He rose to be master mechanic of the road, and was subsequently superintendent of the Ogdensburg & Lake Champlain.

Mr. John M. Egan, president of the Chicago, St Paul & Kansas City Railway, was tried in the United States District Court at St. Paul last month for violation of the Interstate Commerce Law. He was acquitted. but it looked as if he had a narrow escape from retirement.

Mr. J. R. Kenley has been appointed general manager of all the railroad companies comprising the Atlantic coast lines. He will have entire charge of the maintenance and operation, and the heads of departments will report to him, His headquarters will be at Wilmington, N. C.

Mr. Ross Kells, superintendent of motive power of the New York, Lake Erie & Western, who was dangerously sick for some time, has returned to duty. Mr. Kells spent some time in a health-restoring institution, and the doctors denuded him of 60 pounds of adipose tissue.

Dr. Coleman Sellers delivered a very interesting lecture before the Franklin Institute, Philadelphia, on the utilization of Niagara Falls. Dr. Sellers is chairman of a board of engineers, comprising some of the most eminent engineers of Europe and America, appointed to prepare plans for obtaining power for manufacturing purposes from Niagara Falls.

Mr. George W. Stevens, for some years general superintendent of the Chesapeake & Ohio, has been promoted to the higher dignity of general manager. Mr. Stevens began railroading on the western part of the Baltimore & Ohio as an office boy and rose there through the telegraph department to be train dispatcher. He was subsequently superintendent on the Wabash, and left that road to go to the C. & O.

Mr. N. L. Davis, master mechanic of the Rutland Division of the Central Vermont Railroad, died at his home, Rutland, Vt., last month, from the effects of a stroke of paralysis, caused by cerebral hemorrhage. He was born in Maine in 1827, and became a locomotive engineer when 19 years old. He ran the first engine on the Rutland & Burlington, in 1849, and remained in the service of that company and its successors until his death. He was appointed master mechanic in 1864. Mr. Davis was one of the oldest members of the Railway Master Mechanics' Association.

Mr. Eugene V. Debs, grand secretary and treasurer of the Brotherhood of Locomotive Firemen, has been nominated by a meeting of railway employés in Toledo, Ohio, as a candidate for the labor vote for President of the United States in 1892, and the nomination was indorsed by members of the Telegraphers' Brotherhood. There is no officer of a labor organization more deserving of honor at the hands of his constituents than Mr. Debs. He has been a thoroughly self-sacrificing man in laboring to promote the interests of railroad trainmen, and he is endowed with integrity, intelligence and ability that would enable him to fill with honor and credit the highest position to which he could be called.

Mr. Willard A. Smith, president of the *Railway Review* Publishing Company, Chicago, has been appointed Commissioner of the Transportation Department of the World's Fair. Mr. Smith will have charge of everything relating to transportation, from a sailboat to a balloon. He is already at work laboring to make his department a grand success, and is welcoming suggestions from all practical men who know anything relating to transportation. He expects to have the finest exhibition of railway appliances that ever has been collected at one place. Any of our readers who know of any article that helped in the development of railroad machinery, or was tried in early days, should communicate with Mr. Smith, whose office is in The Rookery, Chicago.

The *Iron Age* does not take any stock in electric welding, and expresses the belief that the utility of the process lies only in one direction, which is that an electric current, by securing absolute uniformity of temperature in small articles to be forged, annealed or hardened, can make manufacturers independent of skilled labor.

A German inventor is said to have devised a new substitute for leather in many of its uses. It consists of panels of wood with wire netting between, the whole being glued together under heavy pressure. The sheets thus made are said to be very tough and pliable, and suited for making trunks, and for other uses that require strength.

"Some of the Functions of a Locomotive" is the title of a pamphlet published by Mr. H. A. Luttgens, of Paterson, N. J. The pamphlet treats mostly on proper firing and the regulation of draft. It is given away free by the author. The pamphlet is dedicated to the memory of William S. Hudson, with whom the author was associated in designing locomotives for more than 25 years.

As we go to press reports reach us of a terrible accident having happened to a passenger train in the neighborhood of Paris, France, resulting in the killing of between 40 and 50 persons and the wounding of many others. It was a tail-end collision by an excursion train. The railway carriages used on all European lines have very little resisting power in a collision, and in this instance several of them were knocked into fragments. The gas tank under one of the cars exploded and set fire to the wreck. Reckless running on the part of the engineer appears to have been the cause of the accident.

Persons who have been delayed by the constantly recurring blocks of vehicles in the city of New York would suppose that the residents of that great city would receive with pleasure the proposal of any plan to keep the traffic moving. The aldermen of Gotham are not noted for their intellectual attainments, but one of them had common sense enough to take a suggestion from railroad operating, and he proposed that certain streets should be held for vehicles going up town and others for those going in the opposite direction. Strangely enough the press and the public of New York heaped ridicule on this common-sense proposition.

A theorist who had been watching the operation of the suburban trains in Chicago was tortured with the results of a calculation that figured out one ton of coal to be wasted for every 40 stops made. He proposes to recover this loss of energy by putting disks on the axles of the cars on which the braking will be done. The disks will be rotated in water, which will be heated by the friction of the shoes when brakes are applied, and the heat generated can be used to warm the cars. The saving of energy in stopping will be further supplemented by the reversing of the locomotive, when the pistons and cylinders will be converted into air pumps to compress air in the boiler, which will be given out in starting. The loss due to the use of so many extra traps was not calculated.

The Ravenna Accident.

A dreadful accident happened on the New York, Pennsylvania & Ohio at Ravenna, O., on July 3 by which 21 passengers were killed and 12 severely injured. A through passenger train stopped at the station named at 2 A. M. and the engineer had to put a fulcrum pin in the whistle lever of the engine. The train had not been stopped more than five minutes when it was run into by a fast through freight with the result mentioned.

The investigations of State officers into the accident and the hearing before the coroner's jury have disclosed several interesting facts connected with the events that led to the accident. The passenger train had the right by the rules of the company to stop three minutes at a station before a flagman had to go back to protect the train. In this case the flagman had gone back some distance, although the train had not been stopped five minutes. The blame evidently does not rest with that man. The testimony proves that the freight crew had orders to run from Kent, the next order station, at the rate of thirty miles an hour, and a Boyer speed recorder on the engine showed that this speed had not been exceeded during any part of the run, and that the average speed made was considerably less than thirty miles an hour. This train was not required to stop at Ravenna, and it is difficult to see where any of the crew is responsible for the accident. The real blame is with the company that allows a fast freight train without airbrakes on the cars to be run so dangerously close to a passenger train. It also looks as if the train dispatcher is to blame for giving the orders that permitted this train to chase the passenger train so closely.

The State Railroad Commissioner blames the crew of the freight train for the accident, and the coroner's jury hold the rear brakeman of the passenger train responsible. This conflict of authority in placing the blame is another illustration of the necessity for the appointment of experts to investigate the cause of railroad accidents. No sensible man familiar with railroad rules and train operations would think of placing the blame on either of the train crews, and he would naturally search further back for the real culprit. From the evidence relating to the case it is evident that the running of a fast freight train dangerously close to a passenger train was a common practice, and in that case the superintendents and other officers are to blame in a great measure. It is a very common practice to establish good rules and permit them to be habitually violated in order to save a minute or two. Men will go on for months violating the rules and everybody is cognizant of the fact. When an accident happens then the cry is you have violated a plain rule and the man is punished, but nothing is said to the responsible officers who have been encouraging dangerous practices.

Application has been made for a charter for the Schoen Pressed Steel Brakebeam Company, of Allegheny, Pa. The new company will succeed the present firm known as the Schoen Manufacturing Company, manufacturers of brakebeams and other railroad appliances. The incorporators are Chas. T. Schoen, Henry W. Oliver, W. A. Schoen, Sr., Edward Atley Schoen and W. H. Schoen, Jr.

An analysis of the last few annual reports of the Chicago, Rock Island & Pacific Railway shows us that Mr. George F. Wilson, superintendent of motive power, has been making his mark on the operating expenses since he took hold. For the year ending March 31, 1891, the comparative reduction is about $100,000, the principal saving having been effected in fuel, supplies and expense of repairs. It is well known that with this important reduction, the service has been improved and the condition of the motive power made better than it ever was before.

The New York, Lake Erie & Western have decided to compound one of the ten-wheelers for passenger service that are under construction for them at the Baldwin Locomotive Works. Five decapods have been ordered for mountain service with cylinders 21 × 26, and the compounding of these engines is under consideration, but the officers of the company desire to watch the performance of the ten-wheel compound before they venture on a more extensive experiment.

Very little attention was bestowed upon a communication from the Southwestern Railway Club, read at the last Master Car Builders' Convention, recommending the appointment of mechanical experts to devote their time to the designing of standard types of freight cars for adoption as standards of the railroads of the country. Standardizing zeal did not run very high at last convention, and the letter was referred to the Executive Committee, which was a polite way of suppressing the proposal. Members argue that where it is almost impossible for the railroads forming the Association to agree upon a standard oil-box lid, that there is no use wasting time and energy over the struggle to make an entire car standard. There ought to be little difficulty in getting members to agree upon a standard form of a car body, for there is really but trifling difference now in the design of large box cars, but as the renewing of the whole body of a car on foreign roads is not a common practice, there would be little gained by establishing a standard form.

Communications.

Those Model Repair Shops.

Editor National Car and Locomotive Builder:

We are glad to note the interest taken and criticisms given in the June number of CAR AND LOCOMOTIVE BUILDER regarding model repair shops we sent you for criticism. We would now like to say a word in explanation of some of the points mentioned.

To begin with, it is not the intention of the company to do their own casting, either iron or brass, therefore the absence on such buildings or plan of any buildings for the purpose. As far as chance for future additions is concerned, we think there is ample allowance made. If extension should become necessary, the lumber shed will be moved out in a line with track and end wall of wood shop carried as far as required for the increase. At the machine shop the same thing will be done, that is, to move the casting-house and let the extended shop take its place. The smithshop enlarged the same. The erecting-shop will be lengthened at the boiler-house end, and here we will say that it was the intention of the originator of plan to have boiler-house its own length to the right of where it now is shown, thus allowing clear space at end of this shop. If necessary transfer table and boiler-shop can be extended in same direction.

The suggestion that the storehouse could be placed between transfer table and roundhouse, and there be as convenient as where now located, doesn't seem to be one to profit by, for a storeroom located at the end of a track that runs the length of shop is probably as convenient to every point as it is possible to make it. The boiler-house and coalshed, if located between smith and machine shops, would interfere with the proper amount of light reaching these buildings, and would seriously hinder the carrying of material across the yard from smith to machine rooms, and also interfere by taking up yard room intended for storage of wheels and heavy material of different kin ds Ample yard room between smith and machine and machine and wood shops will be found of great value.

Now to come to the second. Here it is said that the storeroom should be in as central a position as possible to the erecting and machine shops, and that the plan given does not meet this. Now it seems to us that it does meet these conditions. Most of the stuff from this room is used in erecting-shop, and it certainly is a direct line of the shortest distance from where it is now located to all parts of this shop, than if it were placed anywhere else. As far as machine-shop is concerned, if storeroom was placed at the end of this building across the track from casting-house, then the largest per cent of the supplies which are used in erecting-shop must be carried much further. Next, in regard to a frame from an engine traveling the length of the erecting-shop to reach smithshop, it seems very clear that it would be no further this way than to go half the length of erecting and through the whole length of machine-shop to reach a smithshop placed at end of machine-room. Another point of importance is, that a great amount of forging and smith-shop work has to be done for erecting-shop, which does not have to go to machine-room at all, and consequently it is much nearer and more convenient to go directly from erecting to smith and back from smith to erecting without having to cart all the stuff through the length of machine-shop which would be a needless waste of time, with nothing to gain in any way. As far as the forgings that have to be machined, the direct short line across yard from smith to machine shops should give the best of facilities.

The suggestion of placing the woodshop where the boiler-shop is and the boiler-shop on the other side of erecting-shop, is a very good one, and should be profited by, only in making the change we should place smithshop where woodshop now is, and boiler-shop in place of smith-shop. Next, the castings are kept at end of machine-shop because practically all these must go through machining before use. In the second criticism the keeping of two storerooms is thought an extra expense, and that they should be united in one, so as to come in charge of one storekeeper. Now it seems quite a mistake to think that one storekeeper can handle the amount of business that would be required for these two departments for a road of the size given.

As far as putting all the machinery in the machine shop, instead of the heavy ones in erecting-shop, and thus increasing the size of machine-room, the cost of the extra size here would amount to as much as the same amount of space in erecting-shop, and the frames, driven and other heavy parts are certainly handier to the engines if these tools are alongside of erecting-shop than they would be if they had to be carried half the length of erecting-room and over into machine shop; for, with tools located as shown, all that is to be done is to hoist a piece of engine-work from machine to the central track and shunt it direct to opposite the engine it belongs to, thus having to turn no corners nor interfere with any other work, as would be done if these heavy tools were located in machine shop.

As to the third criticism there is no limit to the amount of land, so that the extension can go on in all directions at small cost as far as that is concerned. A large wood shop is, we think, an advantage of considerable importance, as woodworking machinery should be spaced well apart and also have clear ample space for the handling of long lumber, and the general nature of the work requires a good amount of room, in order to do it to advantage. If there is any more here than needed at present it will answer for an increase. It seems as if a 25-foot gap between lumber shed and the brick wall of wood shop was a very ample allowance for fire protection. As to size of smith shop there are shops in the country no larger that 80 feet × 150 feet that contain furnaces and do all the forging of frames, axles, etc., for this amount of engine-work. The engine in this shop is to be housed in securely from dust.

The land taken in the 1,000 feet is for shops and roundhouse alone. We have nothing to do with how far it takes to bring tracks together. There are no main-line tracks shown on the drawing.

As to the power of stationary engines provided, they will be all automatic cut-off and will therefore use no more power than the work requires, and they are intended to be large enough for emergencies and any increase of power that may be wanted in future within certain limits.

As to the 50-feet space from traverser to wall of erecting shop, this is not intended for storage of wheels or anything of the sort, which would be continually in the way of engines, but this space is to be used for steaming up boilers, and is certainly the most advantageous for this purpose.

As to placing all the work of the smith shop, boiler shop and tender shop in one building so as to use the same puncher, shears, etc., for all the work of these three departments, it could not be done, as a separate set of tools in each one of the shops will be none too many, and they will have all they can be made to do to handle the amount of work done for 500 engines. It doesn't seem clear how a shop with five parallel longitudinal continuous tracks can be any smaller in area than the one proposed for 500 engines each. There is no traveling crane built that would span five tracks and the space required between them (at least 15 feet) capable of lifting 100 tons from any of the tracks. Those who have had extended experience with shops built as suggested, with parallel tracks run lengthwise of shop, are very much opposed to them, and denounce their inconvenience in strong terms. It seems as though each one of 25 doors opened once is about equivalent to each one of 8 doors opened 3 times; we should say it was about six of one and a half dozen of the other. As far as snow interfering with the traverser, there is not enough in the locality to give the least trouble.

Now as to fourth criticism; first, the snow question has been settled. Next, as to light alongside of erecting shop, there are to be no vise benches on this side, and the tools set out far enough so that they will get a good light from the roof, which is to have a very large area of glass. As to keeping the part of engines that are to be stored on floor above machine shop there will be none too much room there to place them conveniently and so that they can be got at quickly. As to putting them in storeroom, as suggested in fourth criticism, this room has all it can possibly do to attend to the small stores. Again, the finished parts of engine-work should be kept where they will be directly in reach and in charge of foreman of this department. The element of power for shops has been mentioned. As to driving the different machines in smith shop by independent engines connected direct to each machine, the repairs and attendance would be much more than with one engine driving the whole. The amount of shafting for this department will not be great.

The suggestion of a traveling crane in boiler shop is good and should be followed. As to tender shop and boiler shop being all in one, the amount of work is too great to allow of this, and tender and boiler work are distinct enough so as to make it much more convenient to separate them than to have boilers, tender frames and tanks all mixed up together with no system about the work. The use of a lot of small engines in boiler shop is to be avoided, for the same reasons given for smith shop. As to painting, the suggestion is made that engines should be finished before painting. If an engine is finished and then run into paint shop, coupled to tender, there is no chance to more than half do the work of painting, as when the wheels are in and all parts in place a very large amount of the surfaces to be painted cannot be reached at all, and consequently this would be a shiftless job. By comparison with existing shops, the store house which is for small stores seems to be ample at 50 × 100. As to keeping the machine shop castings next that point, and the tender castings near tender shop, we think this a much more expeditious, economical and convenient method than to have the two mixed up together, where there would be the additional disadvantage of having to carry one or the other a long distance. All the work on tender castings is done in tender shop, and to have the material handy at this place seems to us economy.

Now, we come again to the suggestion of having a number of tracks run longitudinally of the erecting shop. To answer this again it is almost universally conceded to be a troublesome and expensive way of handling the work, engines and material being continually in the way of one another. The central track, if it is used at all, is sure to have one or more engines on it when it is needed to run engines out from the other tracks or in onto them, for with a shop of this size engines would be going and coming from the side tracks every day.

We think that very ample light is to be had, as there are to be windows between large doors. The length of wall between these being 12 feet allows a chance for good-sized windows, and leaves enough solid to support crane and roof, and there will also be windows in each door. Thus we have the light coming down between each engine and thoroughly lighting both sides of them, which would not be secured in the arrangement of longitudinal tracks, as the outside engines would shut it off considerably from those on the inside track.

The radial arrangement, as suggested, is, we think, not practical for a large shop, the disadvantages in such an instance more than counterbalancing the few advantages.

ORIGINATOR OF PLAN.

Center and Side Roller Bearing.

Editor National Car and Locomotive Builder:

In the NATIONAL CAR AND LOCOMOTIVE BUILDER of last month a correspondent, who has side bearings to recommend, attempts to boost his own goods by abusing others', and he takes occasion to write disparagingly of frictionless roller bearings. His plan is the rocker principle, and consequently the roller bearing must be no good. Every mechanic familiar with the moving of bodies under weight is, however, likely to prefer the free moving roller to the uneven working rocker. There may have been defective roller side bearings in use at one time, but there is no master car builder, or like person familiar with the movent of railroad cars, who is likely to deny the merit of the Jewett anti-friction device for center and side bearings of cars. This invention represents the highest development of the roller principle, and late improvements in the manufacture of hardened steel rolls permit the putting of this improvement to cars on the market at a reasonable price.

The Jewett device consists of a series of rolls having an absolute freedom of movement, and which are maintained out of contact with each other and in correct working position by spacing frames or cages. These cages are carried by the rolls and do not in any way make contact with any bearing surface. This device is interposed between the car-body bolster and the car-truck bolster, and the car body rests upon the rolls. Owing to the absolute freedom of the movement of the rolls it is immaterial whether the side bearings support a load of one or ten tons; the truck will curve equally as well under one load as under another.

The absolute freedom of movement of the rolls supporting the car body reduces to a minimum the friction between the car-body bolster and the car-truck bolster, thereby insuring an easy riding car, besides reducing to a minimum the wear on the flange of the wheel and on the rail, thereby greatly diminishing the danger of derailment and saving the sacrifice of life and loss of property.

Every practical engineer can see, when hauling a long and heavily loaded passenger or freight train up a grade around a reverse curve, what an advantage it would be, and what a saving of power and wear upon the flange and rail would be effected, if between every truck bolster and car-body bolster of his train were placed rolls which will move with absolute freedom with the trucks.

A few of the advantages obtained by the use of this device are: saving of power required to move the truck; reduction of flange wear; saving of wear on side of rail; reducing the shocks or side thrust on striking a curve, and the making of an easier riding car.

These bearings are in use on cars belonging to the Boston & Albany and other railroads, and are giving the greatest satisfaction. One car was jacked up after having run constantly for a year, and the rolls were in the condition that indicated they were good for indefinite use.

The truth ought to be known and these are the facts. There is nothing the matter with center and side roller bearings if they are of the right kind. NEW ENGLAND.

The Evolution of Interchange Inspection.

Editor National Car and Locomotive Builder:

In the early days each road was a law unto itself as to patterns and types for rolling stock, and a new road scorned the use of plans of older roads, no matter how suitable they may have proved themselves in actual service, and an alleged reason for the vast variety of patterns of parts of cars was that it prevented "the other roads" from appropriating material because it was not their kind. The interchange inspector appeared with this environment and was of the bulldog type, ready on occasion for a "scrap" to cover any little sharp practice he may have deemed necessary in retalliation on the other fellow.

The transfer gang was a giant in those days. As it was the height of glory for the interchange inspector to block the other fellow with cars, it was impossible to repair in a reasonable length of time. On the other side, the poorer condition cars could be passed on to the other road, even by a little funny business, and more wantonly this was done the fitter the man in charge was considered for his position.

In those days without rule or rote the temptations to a low grade of morality were numerous and not neglected. The numerous delays and damages to freight following from this want of system gave the initiatory impulse to the formation of rules of interchange; against these when issued the old-time inspector kicked vigorously, and by his long and loud protests must have emphasized the need of

the very innovation he was resisting, but the educational process commenced at that time, and from then has come addition and revision of the rules followed by multiplication and division and ratification, with rigidity in application by the higher powers. Out of this the interchange inspector evolved a large sized pettifogger who in the glibbest of styles could make the most liberal and broad application of the rules when his cars were being delivered to the "other road," and as the large latitude exercised by r epair shops in the irinterpretation of duplication of material furnished the interchange inspector plenty of opportunities for the exercise of his talents, of course he soon came again into disrepute by passing whole trains of cars through the rules (as the traditional coach and four could be driven through acts of parliament) any time he caught the other fellow napping; but as this was not often delays, still occurred, and a change was made in the method of application of the rules, and the era of the joint inspector appears; and this uncrowned king, who is "monarch of all he surveys," has the problem still to solve. To do this successfully would seem to need men of legal acumen and judicial attainments, who bo th by temperament and education can mete out just and fair decisions with rapidity, to the satisfaction of two or more masters, which will be a great advance from the time when the Nazarene of Palestine declared that "n o man could serve two masters."

Dope Bucket.

Liquid Fuel for Locomotives in South America.

Editor National Car and Locomotive Builder:

Thinking it might be of interest to the readers of the National Car and Locomotive Builder, I have ventured to send you a communication, on the use of petroleum fuel on this coast of South America.

The Central Railway of Peru commenced about eighteen months ago, to make experiments with the view of changing their locomotives from coal burning to this class of fuel. The experiments were conducted by Messrs. Tweedle & Micott, of the London Pacific Petroleum Company, of Talara, Peru. Neither of these gentlemen had ever had any previous experience with locomotives and worked without any data whatever, but were so far successful that all of the engines of this line with the exception of two are now using this fuel, and most of them giving excellent results. The burner used here is, I be lieve, different from any ever before used in locomotive service, and is one that especially recommends itself on account of its simplicity and the unlikelihood of its becoming clogged. The steam jet is a slot in the end of burner three inches long by ¼ in width, and the oil flows from an opening just above this slot and is caught by the jet of steam and sprayed against brickwork in the furnace.

In the furnace the arch is placed somewhat lower than is the practice with coal, and is built tight against the tube sheet, extending back about two-thirds of the length of furnace. Grates are removed. The ash pan has a double bottom, the dampers opening into the lower section, an opening being left through the centre of the upper or false bottom of about 28 × 40 inches. The rest of this false bottom is covered with brick, and walls built up all the way around to about six inches above mud ring of fire box. In the front, however, this wall comes up and forms the arch.

The burner enters just under mud ring at back end, and is elevated so that the jet strikes the front wall about midway between mud ring and arch. There have been some modifications made from this arrangement, but none of the others have shown as good results.

Some trouble has been experienced from flaws leaking; but this can be prevented by proper care, and more convenient means of regulating the flow of oil to burner, and so avoiding sudden changes of temperature in furnace.

This is of the utmost importance. The amount of air taken into the furnace is, of course, regulated by the manner in which the engine is working, and changes with any variation of cut off, throttle, or speed of train; and as the oil is consumed the instant it enters the furnace, it must be regulated at all times to the proper porportion to combine with the air to ensure perfect combustion, and on a mountain road these conditions are constantly changing.

A common plug cock such as is used for feed cock of pump or injector has been used here, but this is about the worst thing that could be devised for this purpose, as it is very difficult to graduate.

If the fireman wishes to increase the supply of oil, he moves the cock as carefully as possible, but he is almost sure to move it too much and black smoke from the stack is the result, and in attempting to reduce it again he gets it as much too far the other way, and, if the engine is working hard, the great rush of air from below, not meeting with sufficient fuel, reduces the temperature below the igniting point, and particles of oil not coming in direct contact with the incandescent brick pass through the flues unburned coating them with a gummy substance which detracts greatly from the effectiveness of that heating surface, and the changes of temperature also cause leaking.

Great damage to boilers and great waste of fuel may be occasioned by incompetent or careless enginemen. This is particularly the case in firing up a cold engine, as steam is obtained from another boiler for injecting the oil and operating blower, and a fierce fire is frequently obtained from the very commencement. As all of the railroads of Peru are mountain roads, there is a great deal of running down hill without steam. At such times it becomes necessary for economy of fuel to burn a very low fire. This can only be done successfully when ash pan is tight and dampers in perfect condition. When engines are properly arranged and operated they give off no smoke and no smell of oil, and I am confident the fuel is less destructive to boilers than coal. The oil used is petroleum refuse, the kerosene and benzine being extracted, and being deprived of these highly inflammable properties it becomes as safe to handle as any other class of fuel.

It is furnished to the railroad companies at about fifty per cent. of the price of coal, and is undoubtedly destined to become the principal fuel of this coast.

C. L. Dunbar.

Callao, Peru, June 10, 1891.

Testing Steel Tires.

An article on the above subject was contributed to a Belgian journal by E. Roussel, a railroad engineer. The following is a synopsis of the paper prepared by D. Kinnear Clark for the Institution of Civil Engineers:

Steel tires are subjected to three kinds of stress for testing the quality of the metal; tensile resistance of samples cut from tires, flattening tires by hydraulic pressure to the extent of one-sixth or one-seventh of the interior diameter, and submitting sample tires to shocks of a falling body. The first and second, though useful, are incomplete, whereas the trial by shock proves that the tire is capable of active resistance; and in specifying given conditions of deformation, the resisting qualities of the metal are well brought into evidence. Besides that, the shock proof reveals defects which are not proved in the ordinary trials by tension or by compression. The metal may be rendered brittle by the presence of certain metalloids, though perfectly resisting statical stress.

To ascertain the quality of the material of which tires are manufactured, shock trials must be in relation to the dimensions of the tires. To obtain steel of suitable hardness, the maximum deformation produced by the shock of the fall must be prescribed, also a minimum percentage of carbon. The shock is applied to the tire on edge, diametrically.

It is deduced from the tabulated results of shock trials that the work done on the tire diametrically compressed is independent of the diameter for a given relative deformation, which is taken as one-sixth of the diameter. Again, the work done is proportional to the modulus of flexure of the cross-section. For tires of identical section, but of different diameters, the same relative deformation corresponds to the same fall of the ram; and for tires of different sections, shocks proportional to the moduli of flexure cause the same deformations relatively to the diameters.

From the results of this experimental investigation the following tests have been established on the Belgian State railways in contracts for tires: Minimum proportion of carbon, 0.30 per cent. Shock trials, first, for tires of locomotives and tenders, three blows of the ram of 6,600 kilogrammetres (47,738 foot-pounds); second, for tires of carriages and wagons, three blows of the ram of 4,000 kilogrammetres (28,932 foot-pounds). After the second blow, the reduction of the interior vertical diameter is not to exceed one-seventh of the normal diameter; but this stipulation does not apply to wagon tires. It is preferred that the test-tires should be selected from the same running. A maximum of 0.08 per cent. of silicon may be imposed.

Airbrake Matters.

There are many men ignorant of the constructive details and proper means of operating and caring for railroad machinery who ought to be thoroughly familiar with them and who are paid for knowledge and skill which they do not possess. There is no excuse nowadays for men remaining ignorant respecting train mechanism, since the country is flooded with hand-books that describe and illustrate in the plainest fashion every part that ought to be understood. To-day every trainman can travel a royal road to the knowledge of his business, whose smooth way is in striking contrast with the path of those who were seeking after knowledge of train mechanism only a few years ago. In the course of a personal letter lately received from Mr. George Holmes, airbrake inspector of the Norfolk & Western, mention is made of difficulties encountered in acquiring a knowledge of the airbrake that were experienced by nearly all inquiring engineers ten or twelve years ago.

Mr. Holmes says: I have made a study of airbrakes for 10 years, and my knowledge of them was first burnt into me, as I had nothing to explain them except Appleton's Encyclopedia of Mechanics.

MISTAKE OF LAP POSITION.

I have received a copy of your rules of airbrakes (Master Mechanics' Code), and, while they are very good and a step in the right direction, they are at fault in some respects. Since the rules were published some of our men have been trying to go by them without having a proper knowledge of the brake, and the results have been bad. The cause is as follows: In the first part of the pamphlet the engineer is told to put his brake-valve handle on lap to find if the train pipe leaks after coupling up. Let us analyze this. In full release the gauge hands stand together, because the train-pipe parts are connected through a recess in the rotary valve, which recess then lies over a ¼-inch hole that communicates with the space over the piston valve No. 17. This space is connected to the train handle by two of these holes, and not by any other means. When the handle is in running position the corner of the recess in rotary valve still covers the hole to the right of feed valve No. 21, and this shows train-pipe pressure. When the handle is on lap the corner of recess in rotary valve is brought round to the right of hole leading to the piston valve, and the train pipe is cut out from the train hand on air gauge, destroying all communication except the approximate one when handle is at service-stop position. If the rotary valve does not leak and the handle is on lap, the train pipe may be opened and left so, and the train hand on gauge will show the customary pressure or whatever it stood at when handle was placed on lap. A falling off in this position then indicates a leak in gasket No. 22 of pipe leading to small reservoir or gauge pipe, and not on train pipe.

We had one engineer who left Bristol with a bad leak in his air hose which did not show on train hand when engineer's valve handle was on lap.

CHANGE THE TERM EXCESS TO RESERVE.

While instructing engineers I find that they are very much against carrying "excess" pressure, because they connect that with the sliding of wheels. If what is now called "excess pressure" were named "reserve pressure," I am confident that there would be less difficulty in prevailing on engineers to hold it.

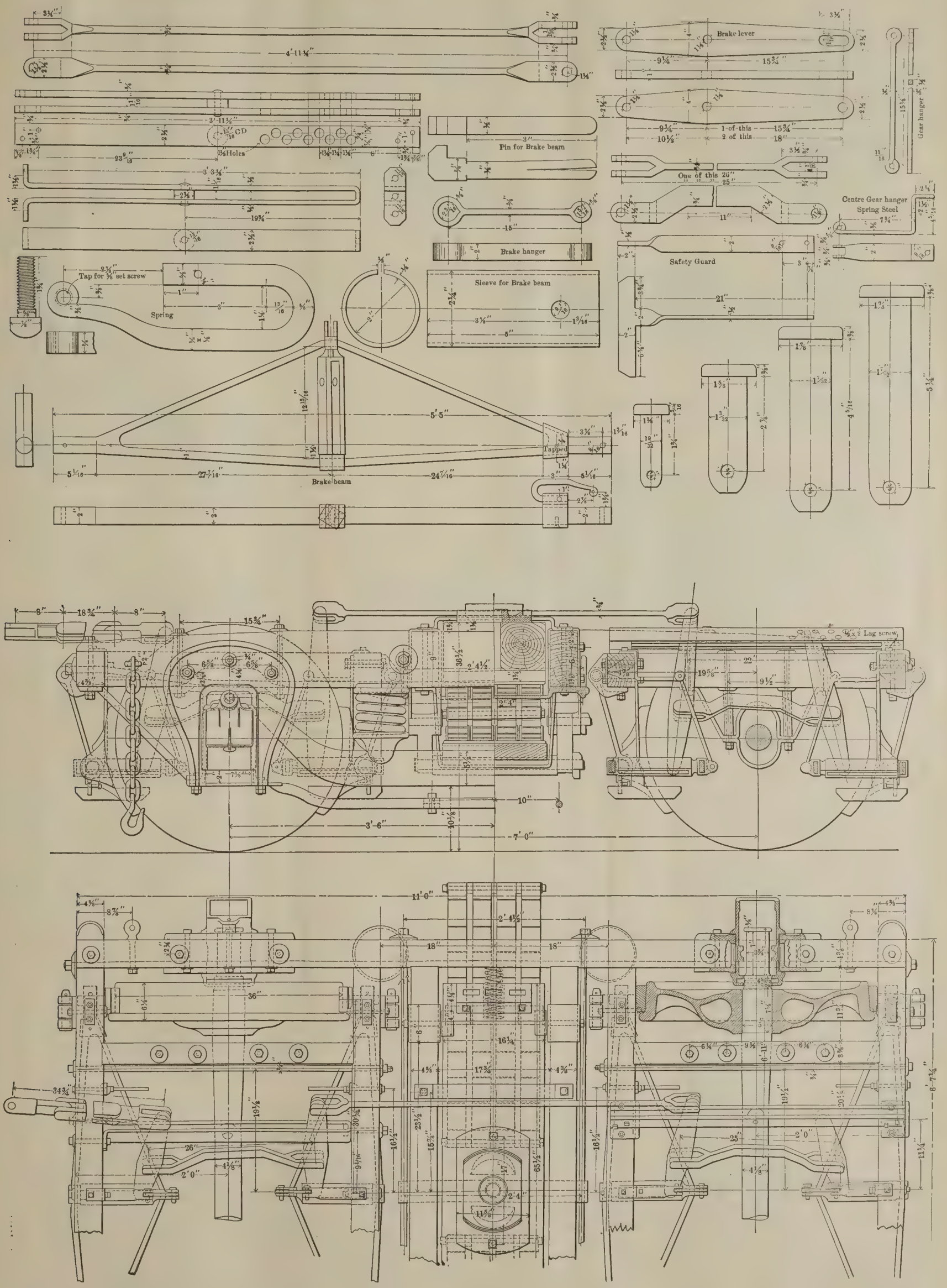
ADJUSTMENT OF RIGID AND YIELDING BRAKE GEAR.

In adjusting-brake cylinder piston travel, the rules call for a travel of from four to eight inches, without stating what the pressure must be reduced to, and some would set up pistons with 4-in. travel at 5 lbs. reduction, others 6 and 7-in. at emergency, which ought not to be used at all. There is also no explanation that a very rigid brake must not travel so short a distance as a limber brake, and as some brakes are at their limit at about 6-in. travel, when they come to be shortened they slide the wheels. Why not explain this matter and caution the reader so that he might exercise his judgment? If this had been done, there are about six pair of small flats that would not have been on the wheels on this division during this week, and better braking power would have been obtained if the wheels had not been slid.

Lime and Soda for Softening Feed Wat >r.

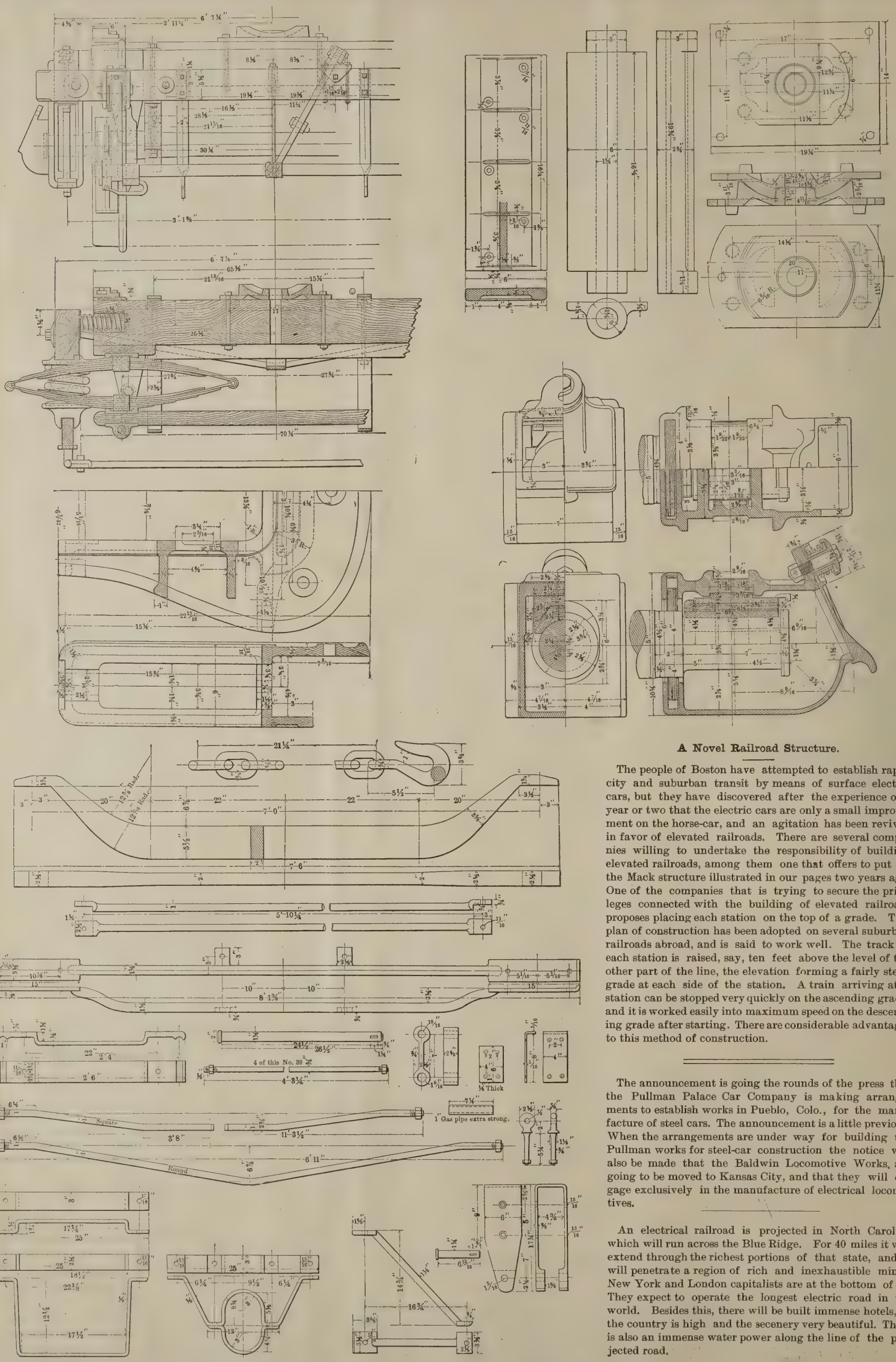
The Clark process of softening water that contains carbonate of lime is in use connected with the water supply of many towns in Europe and works very well. By the process 28 grains of caustic lime thrown into water containing carbonate of lime precipitates 100 grains of that salt, and it falls to the bottom in a fine white powder. Caustic lime will not do any good when the water impurity is sulphate of lime, but that can be successfully treated by caustic soda. Caustic soda will purify water containing carbonate of lime alone, but it works better still if there is both carbonate and sulphate present, for it precipitates the lime from both of them. By the use of caustic soda two important purifying processes are converted into one. As caustic soda is formed by the mixture of lime and carbonate of soda it can be used for a double purpose. When caustic soda is put in water containing both carbonate and sulphate of lime, it attacks the carbonate first, and the lime held in solution by the carbonic acid is precipitated. The caustic soda is by the reaction converted into carbonate of soda, and that acts on the sulphate of lime, converting it into carbonate of lime and making sulphate of soda. The whole of the lime, therefore, is precipitated as the process is continued, and nothing remains but sulphate of soda, which is easily blown out of a boiler.

Some of the European scientific schools are exceedingly enterprising in establishing means of thorough instruction for their pupils. A striking instance was recently seen in Sheffield, England, where an open-hearth furnace was put in operation in connection with the technical school. The furnace is of peculiar form and produces steel by a new process, which is the outcome of researches by Professor Arnold, a well-known metallurgical chemist. The process consists in practically removing the whole of the impurities from Swedish pig iron, with the exception of the exact proportion of carbon required for a given purpose, thus obtaining the carbon and iron steel homogeneous in structure and absolutely free from blowholes, these results being obtained without the presence of more than mere traces of manganese and silicon, and also without the use of iron ore. The average time occupied by this process in the conversion of a ton of pig iron into the highest class of steel yet made will be about three hours, the fuel used consisting of about half a ton of rough slack. The cost of the really necessary portions of this plant would be more than that of an ordinary twelve-hole crucible furnace. Much can hardly be said as to the capabilities of the process, but it is anticipated that the range of the metal produced will vary from what will be practically wrought iron to the hardest tool steel. It is needless to add that the process has been protected by Professor Arnold, a precaution taken by him while t was yet in the region of theory.



PENNSYLVANIA STANDARD PASSENGER CAR TRUCK.

In our issue of May last we illustrated the standard passenger car of the Pennsylvania Railroad, and our intention was to show the newest style of four-wheel truck at the same time, but want of room prevented us from carrying out our intention; but we now give illustrations of the truck, with full details made from working drawings. The truck is very substantially built without having superfluous weight and those that are in service are said to be notable for smooth riding. The wheel base is 7 feet and the extreme length of the frame is 11 feet. The truck is designed for 36-inch wheels which are now the favorite size with this company for passenger cars. The brake is applied to both sides of the wheels by a somewhat simple form of brake gear. The Westinghouse brake-beam is used. The principal timbers of the truck are of white ash, instead of oak as usual, the change having been made with the idea that the shrinkage would be diminished.



DETAILS OF PENNSYLVANIA PASSENGER CAR TRUCK.

A Novel Railroad Structure.

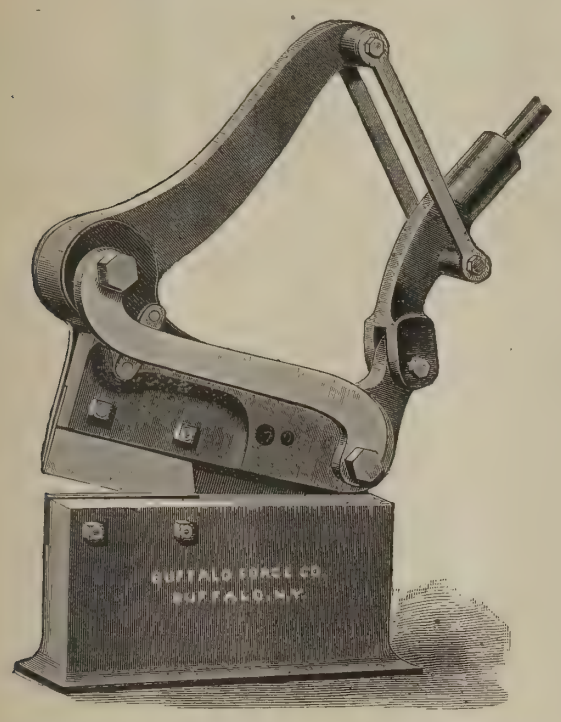
The people of Boston have attempted to establish rapid city and suburban transit by means of surface electric cars, but they have discovered after the experience of a year or two that the electric cars are only a small improvement on the horse-car, and an agitation has been revived in favor of elevated railroads. There are several companies willing to undertake the responsibility of building elevated railroads, among them one that offers to put up the Mack structure illustrated in our pages two years ago. One of the companies that is trying to secure the privileges connected with the building of elevated railroads proposes placing each station on the top of a grade. This plan of construction has been adopted on several suburban railroads abroad, and is said to work well. The track at each station is raised, say, ten feet above the level of the other part of the line, the elevation forming a fairly steep grade at each side of the station. A train arriving at a station can be stopped very quickly on the ascending grade, and it is worked easily into maximum speed on the descending grade after starting. There are considerable advantages to this method of construction.

The announcement is going the rounds of the press that the Pullman Palace Car Company is making arrangements to establish works in Pueblo, Colo., for the manufacture of steel cars. The announcement is a little previous. When the arrangements are under way for building the Pullman works for steel-car construction the notice will also be made that the Baldwin Locomotive Works, are going to be moved to Kansas City, and that they will engage exclusively in the manufacture of electrical locomotives.

An electrical railroad is projected in North Carolina which will run across the Blue Ridge. For 40 miles it will extend through the richest portions of that state, and it will penetrate a region of rich and inexhaustible mines. New York and London capitalists are at the bottom of it. They expect to operate the longest electric road in the world. Besides this, there will be built immense hotels, as the country is high and the secenery very beautiful. There is also an immense water power along the line of the projected road.

Buffalo Continuous Shear.

The hand shear of which we give an illustration has been recently placed upon the market by the Buffalo Forge Coml pany, Buffalo, N. Y. It is especially designed for boiler and other shops where an effective hand shear is required. The mechanism of this shear is unique, and consists in a combination of levers so arranged as to form a powerful knuckle joint, therefore the cutting is done from the bottom. By actual test it has been found that this enables one man to do



more work than two men could with an old-style cut-down machine, where the pressure is against a dead weight. Each vibration of the hand lever causes the tool to shear, thereby giving what builders call a continuous shear. The great efficiency is claimed for this machine, based upon actual test and continuous service for several years before it was placed upon the market. It is made of four sizes, to shear ⅛-inch plate iron up to ⅜-inch, all parts interchangeable.

The manufacturers have also brought out a combined tool, consisting of punch shear and bar cutter, its general mechanism being similar to that of the shear. The operator can use it as a punch, shear or bar cutter without a helper, and no adjusting is required to change the work. Substantially the same mechanism is also applied to the hand punch. Each of these tools finds use in shops where one of the other forms would not be so desirable.

A Steam Cupola.

In a car wheel foundry at Elizabethport, N. J., there is in use a peculiar form of iron melting furnace called the Herbertz cupola. In the ordinary cupola, as is well known, the hot blast necessary for melting the iron is maintained by a pressure of air forced from below through the melting mass of iron and fuel. In the Herbertz cupola a steam jet is employed which puts a suction equal to 3 or 4 ins. of water on the surface of the charge, and the blast is kept up by induction. The steam jet is applied in the center line of the smoke pipe, which connects the cupola either directly with a special stack or is built like the down-comer of a blast furnace, and connects the cupola with a horizontal underground flue leading to any chimney. The top of the cupola is provided with a hopper hermetically closed while the melting is proceeding, and only open at regular intervals and for a very short time, when the charge is being introduced.

The bottom of the hearth is provided with a door turning on hinges and kept tight by a lock. This door, once lowered after the melting is done, turns around the hinges and the contents of the cupola are dropped into an ashpit, where, after having been cooled with water, the unburnt coke can be collected and saved for the lighting of the cupola in the next melting.

The principal advantage claimed for this form of cupola is that it dispenses with the use of a steam engine and all the blast making michinery, that no sparks are thrown from the cupola, and that it melts the metal with less coke than the common blast cupola. They claim that one pound of coke will melt from 16 to 20 pounds of iron.

It is estimated that there are not less than 325 electric railways in the United States, England, Germany, Italy, Australia and Japan, requiring over 4,000 cars and 7,000 motors, with 2,600 miles of track, with a daily mileage of not less than 400,000 miles, and carrying 750,000,000 passengers annually. Grades of 13 and 14 per cent., distances of six miles or more from the central stations, speeds as high as from 25 to 30 miles per hour for single cars and trains of from two to four cars are, according to the *Western Electrician*, features of their operation. Not less than 10,000 persons represent the number employed on these lines. Fifty millions of capital invested in the United States alone, and a present annual business not less than $8,000,000 to $10,000,000 on the part of the manufacturing and contracting electrical companies, show the present standing of the street railway works.

Steel and Iron Car Roofing.

There are many railway officials who greatly prefer a metallic car roofing, provided one could be obtained in which the nail heads were not exposed to the corrosive action of the weather. The Chicago Steel and Iron Roofing Company is now making a steel or iron roof with an improved joint which thoroughly covers and protects the rails. There are two styles in which this roofing material is furnished, both of which are shown in our illustrations. Figs. 1, 2 and 3

Fig. 1.

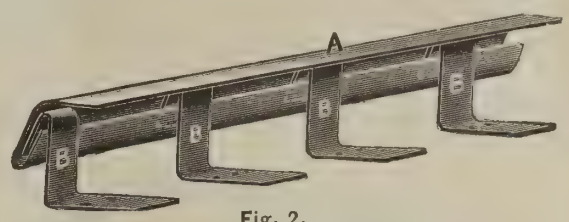


Fig. 2.

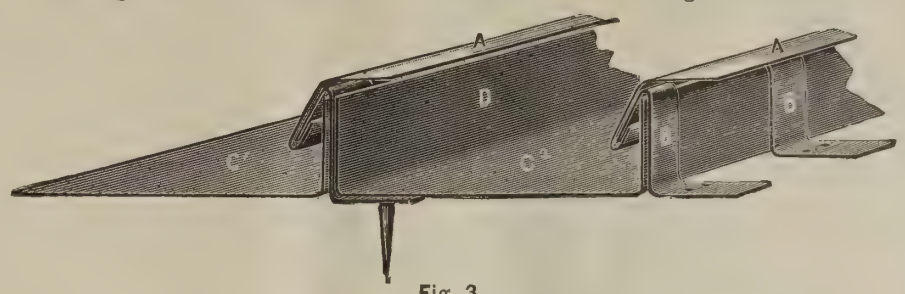


Fig. 3.

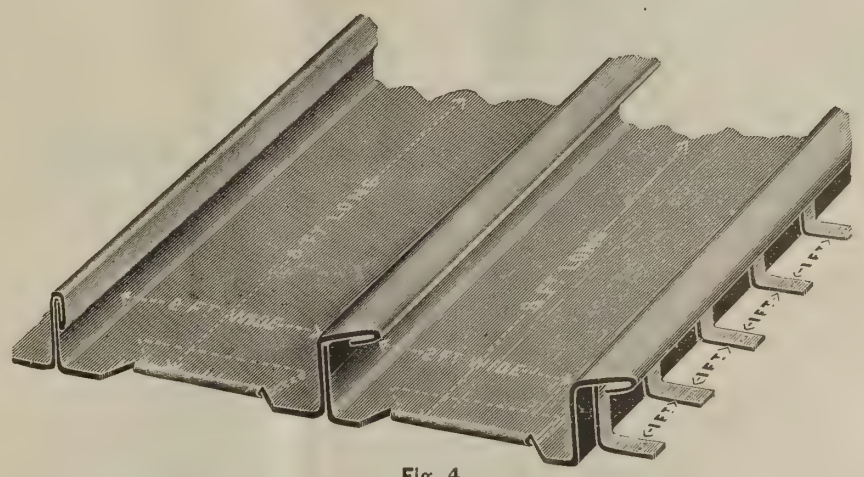


Fig. 4.

show the "Chicago" patent roll and cap roofing. The application of this style is very simple and requires no especial skill. The side seam *D* must first be turned up one inch on each side. The cap (Fig. 2) comes with the cleats (*B*) locked in position. The application is clearly shown in Fig. 3. The joint is then squeezed to a finish with tongs.

The "Chicago" patent lock seam folding caps standing seam roof comes with end locks on the sheets already turned, side seams formed and cleats securely locked in position. As shown in Fig. 4, the sheet (*X*) is first placed in position; the cleats (*Y*) are then nailed; another sheet is then put against the first; the cap (*V*) is folded over as shown at *W*, and the roof is complete.

Both kinds are adapted for use both on car and buildings. Sheets are made of proper size to fit the car, and are put up for either flat or standing seam. They may be had either of iron or steel, and galvanized if preferred. They are painted on both sides before leaving the factory. We are informed that this roofing is cheaper than tin, and, owing to its simplicity, freedom from loose parts and protection of the fastenings, is believed to be much more durable.

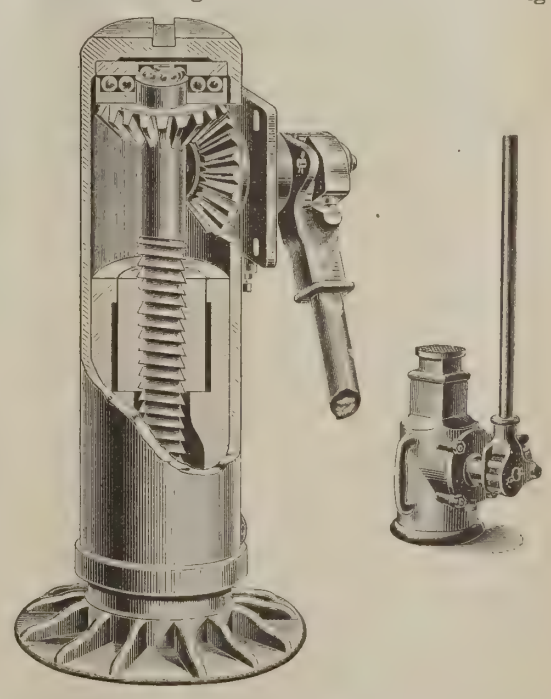
A handsome train of box cars for the Armour Packing Company, Chicago, was turned out of the St. Charles Car Works last week.

Our exchanges are teeming with notices of new branches of the Chicago Steel Car Works that are about to be established everywhere. If the one undivided Chicago Steel Works would turn out some cars that railroad men would approve of and could buy there would be some prospect of business in this line of car construction. So long as this is not done we regard all the loud talk about establishing works everywhere as so much wind intended to advance stock-selling enterprises.

We learn from an English exchange that the American Screw Company, of Providence, R. I., are about to establish a screw factory in Leeds, England. It is said that the screws manufactured will be exclusively of the kind used by joiners and carpenters, and they will be of the English pattern. The machinery for the factory will be sent from America, and be adapted to the requirements of the trade in the old country. It is expected that the building for the works will be ready for occupation about six months hence and that employment will then be found for at least 150 work people (men and girls). At the commencement the output of screws will be at the rate of 7,000 gross per day, or thereabouts. The heads of the various departments are to be sent from America, but they will only remain in England until others have been trained to take their places, it being intended that it shall be a thoroughly English manufactory. The screws are packed in paper boxes, and these, together with the necessary labels and trade marks, will, at the outset, be procured from English firms, but the company intend, eventually, to make the boxes on their own premises, and will, in all probability, print the labels and trade marks there as well. The finished wire used in the manufacture of the screws will also at the start be obtained elsewhere, but the scheme of the company includes the construction of wire mills and annealing furnaces alongside the screw factory.

Norton Compound Lifting Jack.

The Norton improved compound lifting jack illustrated in the annexed engraving, although but a short time on the market, is meeting with remarkable favor from railroad men. This form of jack combines the three greatest powers known in mechanical science, the lever, screw and gear. The lever operates through finely cut gears to turn a screw, the whole combination forming an admirable means of raising or

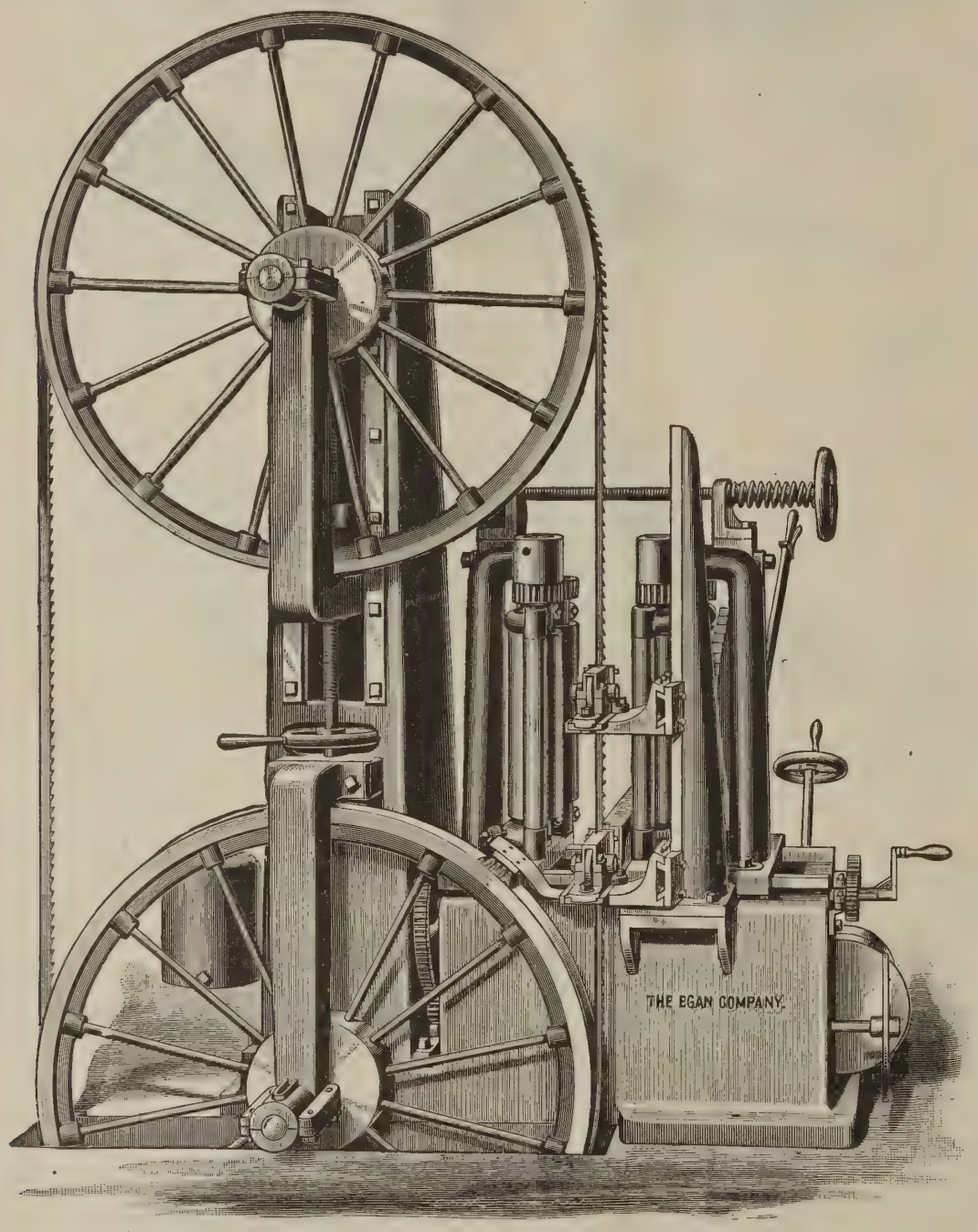


lowering great weights with the least expenditure of power. The jacks can be worked very rapidly, yet they are thoroughly reliable, simple in action and durable beyond comparison with any other lifting apparatus. The lever has an up and down motion of the "pump handle" kind. They are all constructed with a safety stop motion, preventing injury to jack and guarding against the load running the screw out of the nut. The jack is made by A. O. Norton, 45 Oliver street, Boston, Mass.

The "highest" elevated railway is to be built in Naples, to connect the central part of the city with the high ground. The road will rest, in some places, on towers 328 ft. high, and elevators will carry the people to the stations. M. Adolfo Aveno is the engineer, and the estimated cost is £250,000. The power used will be electricity, generated by a waterfall on the River Serreno.

New No. 5½ Band Resawing Machine.

Doing business without advertising is like winking in the dark, for you know what you are doing but nobody else does. If you are making an article worth selling, let the world know about it. The great Egan Company originate or improve a machine and then set about to introduce it. This they seem to know how to do, as their business now is larger than ever before, and phenomenal in its growth. The car builder and car repairer understand fully now that the "something new" brought forward by the Egan people means the best, the latest and the most advanced machine of its class. We therefore take pleasure in laying before our readers an engraving of a very recent improvement in the resawing machine line, and through the further courtesy of the builders of it are permitted to describe it as follows: This No. 5½ band resaw is built to meet a demand for a machine of great capacity



for use in car building plants, railway shops, etc. The many years' experience in building band saws, from the smallest machine for scroll work to the largest band log saw, enables the builders to fill the wants of the trade in this particular class of sawing, and they can especially recommend this machine as superior in every respect to any one now in use.

It is designed and constructed for light and heavy work, and the improved system of gearing—having the two front feed rolls close to the saw blade and an ingenious device connecting the top of roller brackets—enabled them to straighten the plank while being sawed, making a great saving in time and material, and commends itself to all mill men.

The wheels are 60 inches in diameter, made entirely of iron, with extra large hubs and steel spokes and perfectly balanced, with very large steel mandrels running in self-oiling boxes, and so connected to the mandrels as to make it impossible for them to get loose and run out of true. Each wheel is supported by an outside bearing on each side of the column, there being three bearings to both upper and lower shafts. The lower wheel being made thicker and more solid in the rim, is given thereby an increased weight and is an improvement of more than ordinary value.

The feed is very powerful, consisting of six large feed rolls heavily geared, driven by a patent graduating feed, enabling the operator to change the feed instantly by turning a hand wheel while the board is being fed through the machine. A ratchet lever handy to the operator is connected to the upper guide, made so as to change the guide instantly to suit the width of board to be cut and hold the saw blade steady in the cut.

The patent guides are the most perfect yet put on a machine, and are made so as to support the blades when crowded too fast. The improved roller back, arranged as we do it, is a great improvement. The capacity of this machine is very great, and it works equally as well in hard as in soft wood. It cuts 36 inches wide and 12 inches thick. Several pieces of narrow stuff can be cut placed between the rolls one above the other. The rate of feed is from 0 to 65 feet per minute. The builders furnish with each machine one 6-inch saw blade and the necessary wrenches. For further information address the builders, The Egan Company, Nos. 235 to 255 W. Front street, Cincinnati, O., U. S. A.

The Crossen Car Manufacturing Co. will carry on the business formerly run by the late James Cressen, at Cobourg, Ont.

The Dayton Malleable Iron Co., Dayton, O., are making a freight-car door fastner that is gradually getting into general use. A number of roads have adopted it, and wherever used has given satisfaction.

Notwithstanding the dullness that has prevailed for the last six months in railroad machinery and electrical circles, the factory of the Eureka tempered copper has been running on full time, and they still have orders ahead that will last for six weeks without any new ones.

Mr. C. C. Jerome, Canal street, Chicago, informs us that he has just sold the Chesapeake & Ohio Railway Company the right to equip all of its engines with the Jerome metallic packing. This is another victory for the Jerome packing, after a long competitive trial side by side with several other so-called first-class metallic packings.

The Falls Hollow Stay Bolt Co., Cuyahoga Falls, O., report that the demand for the mandrel rolled hollow stay bolt iron they manufacture is rapidly on the increase. They say: Our rapidly increasing trade, which now consists in nearly all the leading locomotive works snd railroad companies in the country, proves the inestimable value of the article we manufacture and the endless satisfaction it has given to all who have used it. We manufacture them of the best charcoal iron (long experience having proved it to be the best material procurable for this important purpose)' which, together with our process of manufacture, enables us to produce a stay bolt entirely seamless and absolutely free from all defects.

New Steel-Casting Furnace.

The Eureka Cast Steel Company, Chester, Pa., have lately built a new furnace, having a capacity of nearly 10 tons, and by widening the melting chamber at any time—for which provision has been made—the output can be increased to 12 tons; all valves, regenerators, ports, etc., being constructed of 92 tons capacity. Some of the improvements in the construction of furnace are believed to be novel, and were designed especially for the work. The regenerators are at ends of furnace proper and entirely independent.

The furnace is carried bodily on heavy trusses, which in turn rest on solid walls at the ends, thus leaving an open space below the bed—the entire length of the bed above—between the end walls below. The ports are also, in turn, separate structures from the furnace proper, and are bound independently also. The furnace proper is *also* a separate structure, bound by itself, thus allowing repairs in any part without cooling off any other part of the combined structure. The space between the ports and main surface is cooled by ventilation from open space below. The ports are designed especially for making hottest possible metal; are protected from the direct cutting action of the flame, and the gas and air are mixed back of the melting chamber, thus insuring a perfectly even, solid flame all over bed of furnace alike.

The ladles are heated in front of furnace by special gas flue carried through the open space below the bed, and the ladle heating arrangements are compact and convenient.

The gas is furnished by two Herrick round producers of the latest form, very simple and effective, and there are certain novel features in arrangement of steam, domicinery, flues, etc., by which the large amount of soot usually deposited is largely avoided, and so it is easily and conveniently removed.

Use Reliable Belts.

In the building of new shops or in the improvement of old ones, the men in charge are generally very careful that the prime motor that drives the machinery shall be of a character not liable to fail and cause the delay and expense that result from unexpected stoppage of work; but short sighted men frequently put in a weak link in the train of mechanism and find that the fountain of power has been paralyzed by the breakage of a shaft or belt. This thought was brought home to us on examining the exhibit of the Shultz Belting Co., St. Louis, where the finest assortment of belting in the country may be seen. Those who have used these belts speak in the highest terms of their efficiency and durability. All the belts made by this firm are really raw hide, for only the outside is tanned, and thus is the secret of their great strength. Having only a thin rigid surface, the belts are peculiarly plastic and stick close to the pulleys, reducing slip to a minimum.

The Consolidated Car Heating Company has established a new department in its business to be known as the equipping department. Mr. J. H. Sewall has been selected to take charge thereof, and he has been designated as Superintendent of Equipment with headquarters at Chicago. He will have charge of the application of all Consolidated Car Heating Company appliances throughout the United States and Canada. He will have associated with him several expert mechanics to act as his foremen.

In the boiler-house of the new locomotive building shops belonging to the Pennsylvania Railroad, at Altoona, they have in use a special form of locomotive boiler so-modified as to adapt it to the use of the mechanical stoker. In connection with the Roney stoker is a complete plant of coal- and ash-handling machinery, and the labor in the fireroom is at once reduced to the often quoted standard of natural gas. The engine plant is a very complete application of the principle of subdivided power. It consists at present of two 15 horse power, one 25 horse power, two 50 horse power Junior engines; two 5 horse power, one 25 horse power and one 35 horse power Standard; three 35 horse power, three 65 horse power and two 80 horse power compound engines. Steam loops and separators are freely used where necessary to protect the engine and economize fuel. The contract for the power plant was carried out by Westinghouse, Church, Kerr & Co.

Our Directory.

Atlantic Coast Line.—J. R. Kenly has been appointed general manager; office, Wilmington, N. C.

Bellaire, Zanesville & Cincinnati.—J. K. Geddes has been appointed general manager, with office at Zanesville, O., vice W. R. Crumpton, resigned.

Central Vermont.—The death of N. L. Davis, master mechanic, has been announced.

Chesapeake & Ohio.—George W. Stevens has been appointed general manager. W. F. La Bonta has been appointed purchasing agent.

Chicago & Eastern Illinois.—W. M. Apps has been appointed master car builder.

Cumberland Valley.—John Lawrence has been appointed master mechanic.

Flint & Pere Marquette.—W. H. Baldwin, Jr., has been appointed general manager, vice H. C. Porter, resigned.

Green Bay, Winona & St. Paul.—S. W. Champion has been appointed general manager.

Louisville, New Albany & Chicago.—S. J. Collins has been appointed general superintendent.

Lynchburg and Durham.—R. C. Standard has been appointed act superintendent, vice W. N. Mitchell, general superintendent, resigned. J. W. Goodwin has been appointed superintendent of motive power.

Savannah, Americus & Montgomery.—W. N. Marshall, general superintendent, has resigned.

Toledo and Ohio Central.—H. A. Cooper has been appointed purchasing agent, vice C. A. Carlisle, resigned. J. D. Parker has been appointed superintendent, vice W. M. Morse, resigned.

Toledo, Columbus & Cincinnati.—C. J. Cooper has been appointed master mechanic at Kenton, O.

Union Pacific.—J. H. Young has been appointed superintendent of the Utah Division.

Employment Wanted.

Wanted—A position as general foreman or foreman of car shop. Held similar position for about six years and over, twenty-five years practical experience. Excellent reference. Address T. W., care of this paper.

Wanted—To superintendents, managers, etc.: An energetic, exact, able and thorough foreman car painter, who learned the trade of car painting and has handled a force of 80 men successfully, wants position where strict attention to business and ability will be recognized. First class designer of ornament and lettering. Unexceptional references. Please address E. X., care office of this paper.

NATIONAL CAR AND LOCOMOTIVE BUILDER

SEPTEMBER, 1891.

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A number of passenger locomotives on the Chesapeake & Ohio are to be equipped with electric headlights.

The Chicago, Milwaukee & St. Paul people have lately put the Grimes valve gear on one of their locomotives.

The mechanical headquarters of the Richmond & Danville system has been removed from Washington, D. C., to Atlanta, Ga.

The Burton Stock Car Company have decided to build 500 cars, 250 for special service in live stock trade on an Eastern trunk line.

The Maine Central Railroad still uses the old straight airbrake on all its passenger equipment, excepting on the cars that are run on through trains.

The mechanical department of the Union Pacific are said to be changing their locomotives back to the diamond stack. This applies to all the locomotives belonging to the system, freight and passenger.

A 140,000-mile run without any repairs is the published record of locomotive No. 13,993 on the Pennsylvania R. R. This engine runs between Altoona and Pittsburgh and makes 468 miles per day.

A German inventor has patented an axle intended for street cars which is in two sections—a tube and an arbor. Provision is made to permit the axle to lengthen or shorten itself under great pressure or jolts.

It is reported that the Canda Car Company have purchased 1,000 acres of land near Cartaret, N. J., on the line of the Central Railroad of New Jersey, for the purpose of erecting a large car building and wheel making plant.

The Union Pacific Railway has not yet adopted the United States threads for its locomotive equipment. When this company orders locomotives from a building firm there is always a big bill of extra expense for making the screw threads the outre sizes called U. P. standards.

A new car coupler of the Master Car Builders' standard type has been patented by Mr. W. L. Holman, master mechanic of the Pennsylvania shops at Renova, Pa., and two other men. The peculiar feature about the coupler is a special slot and pin in the head of the coupler for holding a link.

Vice-President Prescott, of the Northern Pacific Railroad, says his road will have 1,000 new freight cars and 40 locomotives to move the wheat surplus of Washington and Idaho, and that the Union Pacific and Northern Pacific will probably have 15,900,000 bushels of wheat to haul out of those two States.

The Dominion government has received information that owing to the bright crop outlook in Manitoba and the Northwest, the Canadian Pacific Railway Company has ordered 50 new locomotives and 1,500 box cars to transport this season's harvest to the seaboard. On the basis of the estimated yield it will require 10 trains daily for seven months to move the crop.

The Cleveland, Columbus, Cincinnati & St. Louis Railway is the owner of 114 different kinds of locomotives. The diversity has arisen to a great extent through the inheritance from the numerous small roads absorbed. The mechanical department has not yet been able to ascertain the number of cars they have got with different kinds of dimensions and diverse attachments.

We lately saw a long siding at East St. Louis filled with five new freight cars, all bodies painted a bright yellow and the trucks black. The cars were marked Ferro Carril de Monterey al Gulfo Mexicano. They were each 35 feet long, and were marked to carry 60,000 pounds. They had Westinghouse quick-acting air brakes, Hinson automatic couplers and channel iron swing beam trucks.

The Mt. Vernon Car Manufacturing Company, of Mt. Vernon, Ill., are turning out a large number of refrigerator cars for the Union Refrigerator Company of St. Louis. They have also recently taken an order for 300 coal cars for the Cincinnati, Hamilton & Dayton Railroad, and 300 box cars for the Illinois Central Railroad, and some box, stock and coal cars for the Chicago, Ft. Madison & Des Moines Railroad.

An inventor in San Diego, Cal., named Choate, has conceived the idea that the surface of a railroad rail should have a roughened hard strip on which the car wheels with a soft metallic inlaid band should run. He has paid the patent office fees to have this invention protected from the railroad wolves which are prowling around ever ready to swallow proprietary rights of any impracticable folly of this character.

An improvement in passenger car buffers has been patented by Mr. Newall P. Cowell, Cleveland, O. There is a spring actuated backing plate put behind the buffer, the union of the two members constituting a lateral joint whereby the buffer may rock laterally independent of the backing mechanism. The buffer has arms adapted to embrace the car sill. The whole thing makes a very strong and flexible combination.

The steam heating of cars when once entered into by the railroads should be done in the most thorough manner to insure absolute safety and economy. We observe the tendency to practice false economy on the part of a few roads in using light pipes and couplings. This possibly effects a saving of a few dollars per car in first cost, but is attended with possibilities of bursting from strains and corrosion—which more than offset the difference in cost.

The Missouri Pacific Railroad people babbitt the part of their driving-boxes and engine-truck boxes that comes in contact with the hub of the wheel. Before this practice was introduced the wear of hubs and boxes was great enough to seriously increase the cost of repairs for certain locomotives, especially those running fast passenger trains on the curved divisions. Cases were on record where there was a half-inch wear in running 4,000 miles. The babbitt has proved a perfect remedy.

The bad accident that happened on the Erie Railroad in July, when a fast freight train of line cars without air brakes ran into a passenger train at Ravenna, O., and killed a number of passengers, has worked up the officers of several trunk lines badly, and there is likely to be a prompt and needed reform in the hauling of cars on fast freight trains. It has generally been recognized that an air brake is a necessity for fast freight trains, and arrangements are being made to refuse to haul cars in fast trains that are not provided with air brakes.

Two handsome sleeping cars have just been completed at the East Buffalo shops of the Wagner Palace Car Co. They are the first of an order for 30 now building. Six of the sleeping cars are for the Chicago—St. Paul limited trains of the Chicago & Northwestern, and the balance are for service between New York and Chicago. The cars are 70 ft. long, and are equipped with the vestibule patented by General Manager T. A. Bissell. The interiors of the cars are finished in San Domingo mahogany, richly carved. They are to be lighted by the Pintsch gas light, and have the Leland steam heating system.

Mr. James McNaughton, superintendent of motive power of the Wisconsin Central, is taking an active interest in a new spark arresting arrangement which has been applied to one of his locomotives. The spark arrester has been invanted by Mr. J. Snowden Bell, of Pittsburgh, who has been for many years an intelligent worker on the problem of arresting sparks without paralyzing the draught. It is an ordinary sized smokebox and open stack, a sufficient area for netting being obtained by placing it in horizontal and vertical positions. A box is used as a receptacle for the sparks, and it is placed beneath the smokebox. The very best kind of reports are made of the success of the invention in arresting sparks.

An improvement in the band of elliptic springs has been patented by Philo N. French, of Pittsburgh, and assigned to the French Spring Company. It consists of a band of uniform length and having a tapering or graduated leaf gripping area. It will be remembered that Mr. George Morris, of the French Spring Company, patented a spring some years ago with a tapered buckle, the narrow side of the taper holding the short leaves of the spring. This arrangement materially improved the movement of the spring, but it weakened the buckle. The invention of Mr. French secures the elastic action resulting from using the taper band and it also makes a buckle as strong as that usually employed.

Speaking of the alleged discovery of a law in New York fixing the sleeper charges at 80 cents, Assistant General Manager E. A. Jewell, of the Pullman Company, is quoted as saying in New York: "We have not heard much ye about the law except what has been telegraphed to the newspapers, and have begun to investigate the matter. As I understand the law, it provides for a charge of 40 cents a berth for 100 miles, and one-third of a cent for each mile over 100 miles, with a maximum charge of 80 cents. Of course, it goes without saying that we shall not run any plush upholstered, carved hardwood finish vestibule sleepers for any such tariff as that, for the simple reason that it can't be done."

The Pennsylvania Railroad lines are putting air brakes and Janney couplers on all their coal cars. It is admitted by all practical railroad men that coal cars need power brakes more urgently than any other kind of car, owing to the difficulty brakemen have in passing over such cars to set brakes. On the eastern lines of the Pennsylvania system there was trouble with the freight engineers handling the air brakes badly, but this has now been to a great extent remedied. The enginemen on the Western lines handled the trains satisfactorily from the first, and the experience then indicated to the Eastern officers that training was all that was necessary to teach their men how to handle the trains without accident.

The Mount Vernon Car Manufacturing Company, of Mount Vernon, Ill., are turning out a large number of refrigerator cars for the Union Refrigerator Transit Company, of St. Louis. The cars are to be used by Underwood & Co., of Chicago, pork packers, and the Omaha Packing Company, of South Omaha, Neb. The cars are equipped with air brakes and patent ice tanks, and altogether make a very fine car. They have also recently taken an order for 300 coal cars for the Cincinnati, Hamilton & Dayton Railroad, and 300 box cars for the Illinois Central Railroad, and some box, stock and coal cars for the Chicago, Fort Madison & Des Moines Railroad.

In spite of the many warnings given to railroad men about the danger of running with air brakes out of order there are constantly to be found on some of the most important passenger carrying line trains that do not have half the standard braking power at the command of the engineer. A passenger train on the Philadelphia & Reading Railroad one day last month had so many of the brakes out of order that a station was run past and others had to be crawled into. When a freight train happened to be occupying the main line at an unexpected point, nothing short of a bad collision was to be expected. The engine of the express was overturned and wrecked, the smoking car and first passenger car were piled up on the tender, the second passenger car was overturned and the third remained upright. The first passenger car was almost over the wrecked engine, and several persons were badly scalded. Strange to say, nobody was killed, but 18 were injured, some very seriously. The accident was, of course, attributed to failure of the air brakes.

The *Milwaukee Wisconsin* says: "George Gibbs, mechanical engineer at the West Milwaukee shops, is still experimenting with ventilating fans in the dining cars which run between here and Chicago on the St. Paul road. The fans have on the whole proven successful, but there are many little details to be perfected before they are introduced on all of the cars. The object of the fans in the dining cars is more to keep the air in circulation than to bring in fresh air. One fan is located in the kitchen and two in the body of the car, all being operated by the electric power which is generated for the electric lighting system now in use on the limited trains. Before long Mr. Gibbs expects to put fans in all the dining cars on the St. Paul system, and also in the parlor and sleeping cars. In the sleeping cars the fans will be designed to carry off the foul air, there being plenty of ways in which fresh air can enter. It is needless to say that any invention which will relieve a sleeping car of its foul air, so especially noticeable when a person wakes in the morning, will be greatly appreciated by the traveling public.

Talk to Your Fireman.

It is the duty of a locomotive engineer to show his running orders to his fireman. If you are ordered to sidetrack at Toltec for No. 9, the fireman commences to figure on that. If he has a good steamer he will let his fire burn low in nearing a meeting point, so his engine won't pop. If he has a poor steamer, he will scheme to keep his steam up to the meeting point, and in either case, if the engineer pulls by, the fireman will be the first man to notice it. It will not detract from the engineer's position to mix up a little, socially, with his fireman in this way, and it will make the fireman a good engineer. If we were making train rules we would compel engineers to do this, and if that failed to work, we would have an extra copy of the train order made for the fireman. The conductor should show his orders to the brakemen. The average brakeman is a much smoother man on train orders than the fireman, but he is not sure to remember them for the very reason given in the beginning of this article. Had Engineer Hopkins shown his orders to his fireman, the awful Carlisle collision could not have occurred. Many will object to this, and say it is unnecessary and takes too much time. It will probably take some time to re-build these engines and cars—it will take some time for the wounded to get used to their wooden legs—it will take some time to heal the broken hearts of the widows of the dead. Talk to your fireman.—*Western Railway.*

Shop Notes.

Editorial Correspondence.

THE MISSOURI PACIFIC SHOPS.

The Missouri Pacific is one of the greatest railroad systems in the country, yet a visit to the repair shops of the company at St. Louis would convey the impression that the place was the mechanical headquarters of some small road with less than 100 locomotives. The truth is that the company own about 600 locomotives and over 20,000 cars, and how this great aggregation of machinery has been kept in decent order with the facilities provided is a mystery. There are several shops with considerable capacity at different parts of the system, but the whole of them are away behind the needs of the machinery for maintenance.

MAKING THE BEST OF POOR FACILITIES.

A visitor to the St. Louis shops finds nothing to admire about the buildings, but he is certain to be struck with the ingenuity displayed by the officers in charge in overcoming the difficulties due to inconvenient shops poorly equipped. Mr. Frank Rearden, who is now superintendent in charge of the whole rolling stock, is working vigorously to put the machinery in good running order, and his efforts are zealously supported by Mr. L. Bartlett, master mechanic, and a corps of remarkably able foremen. A striking peculiarity about the shops is the success in applying power to operations usually performed by hand, and the number of ingenious methods that are employed to secure accurate reproductions. The shops are piped in all directions for conveying air pressure to drive portable engines that drive machines for drilling, tapping, planing, etc., in places where the ratchet drill, chisel and other tedious and laborious methods are usually followed.

Like many other unfortunate railroads, this company has got a multitude of locomotives of the same cylinder capacity, but made from different drawings, the consequence being that the number of patterns carried is a heavy burden on the department. They are working out the lightening of this load by changing all the leading parts to a general standard when it can be done, a line of work that will pay well when accomplished.

Mr. Bartlett, and his general foreman, Mr. Fulden, have been very successful in getting a large production from certain tools. They use a double fork-like tool for turning packing rings for pistons, and one man finishes over thirty rings a day. With flue hole cutter which they use a man can drill 20 holes an hour in a ½-inch flue sheet. One man bores 30 wheels a day, and another man turns 12 axles a day. This latter performance is better than anything I have ever seen elsewhere, and I am disposed to think it is not a regular thing. They press on from 75 to 100 wheels a day on one press.

TO PREVENT FIRES.

A precaution in use in these shops against fire is worthy of imitation. It is well known to the initiated that the smoldering torch hastily placed in the workman's cupboard in close proximity to inflammable material is frequently the cause of mysterious fires. A fireproof torch case is kept in the tool-room of these shops, and every workman on going out has to hand in his torch, which is placed in the hole bearing the same number as the workman's check.

BURLINGTON, CEDAR RAPIDS & NORTHERN SHOPS.

The Burlington, Cedar Rapids & Northern runs mostly through Iowa, the State of affliction for railroads, but this company has enjoyed a ray of prosperity that has not shone upon many railroads in the Hawkeye State for the last few years. The majority of the stock of the company is held by larger connecting lines, and no dividends are called for, the surplus earnings going into betterments of the property. Business has been increased gradually with a very healthy growth on the divisions that were originally extended into an unsettled country, and the company has received a living return for the business done. This condition of affairs has encouraged the management, not only to maintain existing machinery in the best condition, but to invest in some new rolling stock. They have ordered 10 new 10-wheel locomotives from Brooks, and 500 freight cars from the Peninsula Car Works.

The repair shops at Cedar Rapids have been exceedingly busy getting the motive power and cars ready for the harvest of business that comes to roads in these parts after the farmer has got his bountiful harvest safely housed.

MAKING PARTS INTERCHANGEABLE.

A highly practical policy has been pursued for years by Mr. R. W. Bushnell, general master mechanic, in regard to the repairs of rolling stock, that now makes the work easy and cheap. The company had a variety of engines of the same cylinder capacity, but differing in other particulars. Driving springs, truck springs and tender springs, with their attachments, were almost as varied as the numbers of the engines. This was the first thing to be reformed. One size of spring was made to suit every place where it would carry the weight, and the connections were changed to suit. The same condition of oddity existed in respect to cylinder heads, pistons, eccentrics, boxes and a great many other parts which have now been reduced to standard forms. The advantages from this change are that less stock has to be carried and the standard parts can be worked up and put in stock at any time. Of course there is less time wasted by a workman when he is repeatedly making an article of standard size.

AN ARRAY OF CAR COUPLERS.

In the car department Mr. William Voss follows a similar policy in respect to cars, and I know of no road where the car repairs are so systematically conducted. This company have been applying the Master Car Builders' coupler of various types to their cars, and the officers are fairly well satisfied with the results. The breakage has been quite limited. In connection with couplers Mr. Voss has arranged a good educational medium in the car repair yards. On a stout bench are arranged all the leading car couplers, and secured as if in the draught timbers of a car. This enables the car inspectors and repairers to become familiar with the peculiarities of all the couplers in use. It is also a good way to enable the officers of the company to comprehend the merits of the various couplers offered for adoption.

The laws of Iowa call for the application of air brakes to all locomotives and cars within a limited time, and the Burlington, Cedar Rapids & Northern are preparing to obey the law by putting air brakes on all their locomotives.

CHICAGO, MILWAUKEE & ST. PAUL SHOPS.

The repair shops of the Chicago, Milwaukee & St. Paul, at West Milwaukee, have been falling behind the demands for work on rolling stock, and the company have lately built an annex to the planing mill and increased the capacity of the iron foundry. The latter is now the best equipped foundry I have seen in connection with a railroad shop, Mr. Barr, the superintendent of motive power, having for years taken particular interest in foundry matters. The most approved appliances are provided for aiding the various operations, and the place is so arranged that the castings can be moved toward the cleaning shop without interfering with work on the floor. From the cleaning shop they are taken to a weighing scale and thence by an inclined platform to be loaded on cars.

HANGING BRAKES OUTSIDE.

Besides the enormous amount of running repairs that have to be done to freight cars in these shops, they are building 10 new cars a day. The standard box car for 60,000 pounds which they are building is a particularly well designed car. It is 34 feet long, very strongly built of good material, and is equipped with all the appliances now regarded as necessary for a first-class freight car. It has Janney couplers, Westinghouse air-brake, National Hollow brakebeams, and strong swing motion truck. The brakes are hung outside the wheels, a plan that is in decided favor here, where inside hung beams have been largely used. Unless an inside beam is hung from a point above the springs it soon rattles itself out of order, and there are the same reasons for not hanging it above the springs that exist against hanging it to the body. Then the brakes hung inside are very inconvenient to reach, and accidents have happened repeatedly on the road through the delay in getting inside brake rigging taken down. For these reasons more roads than the Chicago, Milwaukee & St. Paul are going back to the practice of hanging their brakes to the car body outside the wheels. When the hangers are made heavy enough and properly designed the danger from breakage is very slight.

They have been doing some highly creditable work in the locomotive shop here that is well worthy of notice. An eight-wheeled locomotive built here some time ago appears to have been as well designed and finely built an engine as I have ever examined. The engine is small, only 16 × 24-inch cylinders, with 62-inch driving wheels. The boiler carries steam of 160 pounds pressure, and that pressure is so well maintained in the cylinders that the engine does with ease, and with much less fuel, the same work performed by the 17 × 24-inch engines. The frames are made unusually strong and the axle boxes are large. The boiler has a wagon top and the crown is secured by radial stay bolts, the dome being placed on the tapered sheet. Unusually large tubes are employed in supporting the brick arch. They are three-inch tubes, unusually thick, and expanded in the fire-box sheets, the outside opening being made large enough to admit an expander.

The engine I saw had run over 100,000 miles since she left the shop and was still in first-class running condition. A soda compound had been used in the feed water, and the boiler showed no signs of being fouled, although other engines had to have the flues removed after about half the mileage this one had made.

CHICAGO & NORTHWESTERN SHOPS.

During a brief visit to the shops of the Chicago & Northwestern at West Chicago, I found Mr. William Smith, superintendent of motive power, full of plans for improving his department, which he is working at with the slow and sure vigor for which Clydesdale men are noted. Those who have been accustomed to visiting these shops could notice that the tools are better speeded up than they were wont to be, and that the workmen are taking more business-like cuts. Various changes have been made to promote the rapid production of repaired locomotives, among which is the introduction of a good overhead crane and a re-arrangement of tools.

Among the current improvements on the motive power here is the putting of airbrakes on all the locomotives that come into the shops for repairs. This company uses a good, large driving axle, which is shouldered in the middle of the wheel. Since this practice was introduced they have been unusually fortunate in escaping from the annoyance of broken driving axles, but the tender axles have not been so satisfactory. To insure against accident they are now putting in the heavy M. C. B. standard axle under all tenders, the journals, of course, being 4 × 8 inches.

Like many other companies, the Chicago & Northwestern have difficulty in preventing the switching engines from forming double flanges on the driving wheels before any other part of the engine needs repairs. A legacy of small switchers over cylindered makes severe demands on the driving wheel lathes. They tried several plans to keep the wheel tread in shape, but all remedies against double flanges failed until they applied brake shoes with a corundum lining. This has worked perfectly, and the wheel question is under control, so that the wheel lathes can be used on the tires of road engines.

This company has taken time by the ear in preparing for the rush of business coming on, for they have arranged months ago for the fall delivery of some 60 new locomotives. There are 30 freight 10-wheelers, the total weight of each engine being 120,000 pounds. The cylinders are 19 × 24 inches, the boilers 58 inches diameter in the front, and the driving wheels 49½ inches diameter. The boilers have a total heating surface of 1,545 square feet. There are 247 tubes 2 inches by 12 feet 6 inches, and the fire-box is 95 × 40⅜ inches.

There are 20 passenger engines, with cylinders 18 × 24 inches, driving wheels with 57-inch centers, and a boiler 56 inches diameter, supplying 1,437 square feet of heating surface.

There are 10 six-wheel connected switchers, with cylinders 17 × 24 inches and 45-inch wheel centers. It seems to be a fair criticism to say that all those engines have the driving wheels too small. The tendency of the time is to accelerate the speed of all trains, and on fast trains a small wheeled locomotive hammers itself and the track in a manner that seriously increases the cost of maintenance. While many railroad companies are incurring great expense to increase the wheels of their locomotives by scrapping the old wheels, it looks strange to see a company like the Chicago & Northwestern falling into the ancient expensive mistake.

WHERE NOVEL SPIKES ARE MADE.

Any railroad man returning from the Chicago & Northwestern shops will find an interesting place on Chicago avenue which is well worthy of a visit. This is the works belonging to the old-time master mechanic, Mr. Morris Sellers, where the famous Samson splicebars are made. Splicebars are not articles that motive power men as a rule dote upon, but they will find here a variety of special machines performing operations that will excite admiration in the dullest mind, and there are few mechanical men who will not consider a visit to this place a valuable experience.

When Mr. Sellers was a master mechanic he aimed with eminent success to be the most advanced of his class, and his father's son had no business to do other than distinguish himself as a mechanic and engineer. When he went into the rolling mill business he retained his ambition to be at the top, and he keeps getting there. Making splicebars naturally led him to take a keen interest in all track fastenings, and years ago he concluded that the weak link in our track was the spike. There are two conspicuous faults to the common spike—it splits many ties in driving, and it goes into the wood by bruising the fiber which gives it a bed of crumbled wood that has small tenacity for holding the spike. These facts were realized by Mr. Sellers long ago, and he, along with his superintendent, Mr. Greer, experimented for years with all sorts of shapes, till now he has developed what he calls the Greer spike, which appears destined to effect a revolution in the spiking of railroad iron. The Greer is of a different shape from the common railroad spike, being wider and thinner, the exact dimensions being $\frac{5}{16} \times \frac{7}{8}$ inch. It has a very strong head and neck, and the point is ground to a cutting edge. When this spike is driven it cuts the wood fiber, and the separated grain squeezes the large flat surface of the spike, making it extremely hard to draw. This of course increases the efficiency of the spike as a fastening in proportion to the increase of resistance to drawing. Another advantage possessed by the Greer spike is that it completely fills the hole made and leaves no depression in the wood to fill with moisture and cause premature decay.

There is an apparatus in the mill—a very ingenious thing too—for measuring the pull required to draw spikes. Any persons interested can see for themselves how the resistance of the Greer spike compares with that of the common spike. When driven into an oak tie the Greer spike stood a tension over 8,000 pounds to draw it while the common spike came out with a pull of 6,000 pounds. Difference one ton in favor of Mr. Sellers' invention. When driven into a cedar tie the Greer spike held with a pressure of 3,992 pounds and the common spike yielded with 1,672 pounds. This was 2,320 pounds, or more than double in favor of the improved spike. This is an exceedingly important difference, and I cannot see how railroad companies that use soft wood ties can afford to do without this spike which so greatly reduces the danger from the track spreading.

The making and sharpening of the spikes are exceedingly interesting operations. They are made from billets of open hearth steel which are rolled into a long bar, having the same cross section as the side of the spike. This bar is then fed to a powerful press and the spikes cut off finished, except for sharpening. The great pressure puts some temper in the steel, and this is taken out by annealing in a furnace. From that the spikes are taken to a grinding apparatus, a wonderfully complete automatic machine. A heavy endless belt passes along a plane on each side of which emery wheels are set with grinding face parallel with the belt. The belt carries a number of triangular chucks which each hold a spike, and have wings that protrude to the emery wheel and act as a spring to press the point of the spike against the grinding edge. A boy stands at one end of the table and slips spikes into the chucks about as fast as he can pick them comfortably out of the keg. As it leaves the end of the plane the wing of the chuck strikes an emery wheel on the right, and one side of the spike point comes against the grinding surface. As that wheel is passed a wheel on the other side clutches the wing and the other face of the spike is held to that wheel. Two more wheels are encountered in a similar way and the finishing touch given, leaving the spike sharp enough to pare one's nails.

CHICAGO, ROCK ISLAND & PACIFIC SHOPS.

The Chicago, Rock Island & Pacific Railway Company have a great many locomotives that have been built within the last five years, but the engines are in many respects deficient in what may be regarded as modern proportions. Since Mr. George F. Wilson took charge he has worked out designs with proportions that will be equal to the work locomotives have to do in these days of heavy trains and fast speed. The boilers have been materially enlarged, the frames made stronger, room provided for axle boxes of proper size to take in a large axle and yet leave a box with plenty of material in it, the passages of the cylinders have been made large enough to let the steam through at an approach to the boiler pressure, and all the minor attachments have been made equal to the requirements. The driving axles are steel, with journal 8 × 9 inches. The crank pins are large, of case-hardened iron. Cast steel is used for tumbling shafts, rock shafts, crossheads, etc., the superior quality of this metal that can now be had making it entirely reliable. The crossheads of the Laird pattern have an unusually large bearing surface, the guides being 7 and 5½ inches wide. The eccentrics have a 4-inch face, and care has been directed to fastening this important part of the motion securely. They are keyed to the shaft, and further secured with set screws that press upon a toothed die.

WELDING PREFERABLE TO FITTING FRAMES.

The practice adopted by many roads of fitting and bolting on the lower bar of engine frames has been followed here. The argument in favor of this practice is that when the lower frame bar is welded on, it contracts different from the upper bar in cooling, and the resulting strain eventually leads to breakage. Experience with the fitted frame proved that it was not only expensive to make, but that it was given to working loose in the fastenings, and putting severe stresses upon the main bar. Owing to this, the Rock Island people have gone back to the practice of welding the ends of the lower bar.

Among my miscellaneous notes of this shop practice followed by Mr. John Black, Jr., the master mechanic, who makes a very energetic shop manager, are: They anneal main rods and side rods after making a certain mileage. They bolt the surface plate on the steam chest for the Richardson balanced valves, and find the adjustment easier made than when the whole thing is cast together. Magnesia covering is almost exclusively used for boilers, and it is liked much better than wood. With it the boiler can be examined more easily, as when wood lagging is employed it is a non-conductor of heat and it never takes fire.

There have been decided improvements in the erecting shop lately in the arrangement of tools. They have put in a drop table which is used constantly for taking wheels from under engines. There are several new tools in the shop, among which I recognized a Pedrick & Ayer side planer, which is well spoken of. They have an air plant for pumping air into pipes that lead the supply to all parts of the shops, where it is used for power purposes. Two Westinghouse and one New York air pumps are employed. The latter pump is reported to be very inefficient compared with the others.

The boiler shop is particularly well equipped with appliances for building boilers. They have in use a Bement & Miles hydraulic riveting machine, which not only does the best kind of riveting, but is used with decided success for punching plates that cannot be put in the puching machine. All the holes for boilers and tanks are punched, and the sheet is afterward annealed. They are careful that all flanging is done at a good red heat and there is no trouble from cracked sheets. Among the novel jobs I saw done here was the bending of smokebox rings in the power rolls.

The blacksmith shop of these works is famous for the the variety of its formers for producing work with the bulldozer. There have been many new ones introduced since I mentioned the subject before, some of them being very ingenious. Among new forms pressed into shape are expansion pads for locomotive frames, crown bars and truck equalizers. The latter is a long, awkward piece to press into shape, but it is done in a first-class manner.

CAR SHOPS.

There have been many changes in the car shops since Mr. Wilson took hold of that department. The portion of the main building previously used as offices for the car department has been converted into an electroplating establishment, and a fine plant for electroplating and for cleaning up polished car fittings has been put in. They found that with existing facilities it cost much more to build cars here than they could be bought for, and the practice of building has been abandoned. The planing mill is too small for the current repairs and it is very short of necessary tools. They are making some changes that will increase the capacity of the mill, new tools being a part of the improvements.

Mr. M. C. Leonard, the master car builder in charge of the shops, has very progressive ideas about systematic methods of doing work and the maintaining parts uniform. He is working to make the parts that are supposed to be M. C. B. standard really standard, and there is a surprising amount of change to be made before the practical accuracy that means interchanging with M. C. B. standards on other roads is secured.

They are taking the wooden brakebeams off all passenger cars and substituting the National hollow brakebeam, which is also put on all new freight cars. They use a steel casting for the Miller hook, and the intention is to work steel castings into other parts of car work that call for more strength than cast or malleable iron gives.

A. S.

Gas Electric Car Motor.

A new method of car lighting, the invention of Mr. W. H. Patton, has lately been tried at the Pullman works with some promise of success. The apparatus consists of a mechanical and electrical combination, as follows: A gas engine, dynamo motor and storage batteries.

A gas engine is placed in position in the center of the car, resting on the trucks, and is geared direct to the dynamo by means of a friction pulley, no belts whatever being used. The dynamo furnishes the current for the motor, from which the propelling power of the car is obtained. In going down a grade, running on a level piece of track, or carrying a small load with a car whose generating power is entirely self-contained, there would necessarily be a surplus of current. The storage battery is arranged to take up this surplus current that would otherwise be wasted. A gas engine ordinarily is started by hand power, but here the current of the batteries is thrown on, which starts the engine, after which the batteries are thrown off and the dynamo generates current for the motor.

Opposed to the Importation of Cars.

A Melbourne paper lately received has the following, which is headed "an explanation to be demanded:"

At a meeting of the Coachmakers' Rolling Stock and Wheelwrights' Society at the Trades Hall a few nights ago, a member surprised the meeting by reading an extract from an American paper, the NATIONAL CAR AND LOCOMOTIVE BUILDER, stating that as the result of some correspondence the Pullman Car Company (America) had received an order for the completion of several cars of the most modern design for the Australian railways, and that the work was now rapidly approaching completion. The cars were being built in sections, and were now almost completed. They were to be shipped to Melbourne in sections. Then the upholsterers, painters and expert carpenters would be sent to finish the cars and complete them for use.

The secretary was instructed to bring the matter under the notice of the Commissioner of Customs, and to inquire if the report was true.

The matter was laid before the Commissioner of Customs, and it was learned that the cars referred to were intended for New South Wales.

An Italian inventor has devised a preparation of lignite and hydrocarbons that makes a fuel suitable for locomotives. As there are large deposits of lignite in Italy this is considered an exceedingly valuable invention. Concerning an experiment with the new combustible a foreign journal says: The train ran easily and smoothly up one of the steepest gradients of Italy. The quantity of fuel used during the transit was 367 kilogrammes, as against 300 of ordinary coal. The train was a heavy one of eight carriages and luggage van, and there were 70 passengers. An English gentleman said England would witness with pleasure the success of the experiment and the commercial emancipation of Italy. A telegram was sent to the King announcing the success of the experiment. A very brilliant gas is also to be obtained from lignite. The importance of this new manufacture will be seen when it is remembered that Italy now pays from $20,000,000 to $25,000,000 yearly to other countries for coal, and that her supplies of lignite are practically unlimited. The smoke from the new combustible is very light and not disagreeable in odor.

The Wells & French Car Works.

Since Mr. T. A. Fraser took hold as superintendent of the Wells & French Car Works in Chicago, he has materially increased the capacity of the works by re-arranging tools and effecting inexpensive changes in the plant that increase the convenience for handling material. He has devised and put in use a very convenient arrangement for handling wheels that are getting the axles put in. The two wheels are set up in simple grips facing each other, and one of the wheels stands on a sliding rest. This wheel is slid back till the axle is entered upon the other one, and then it is pushed forward and the axle entered in its seat. The wheels are then ready to roll into the wheel press which is beside them. Since this practice was introduced, they have not had a journal damaged while putting the axle in the wheels.

These works are fairly busy building cars for the Baltimore & Ohio, the Lake Shore and the Chicago, Rock Island & Pacific. The B. & O. cars are particularly heavy gondolas for carrying 60,000 pounds of coal. They look as if they might stand twice the load without breaking down.

The Chicago, Rock Island & Pacific work is box cars, large and heavy, but marked to carry 50,000 pounds. They have the large M. C. B. axle and are intended to carry 60,000 pounds, but they are marked lower in hopes that shippers will not put more than 70,000 upon them.

Nearly all the cars under way in these works are being equipped with the M. C. B. coupler.

The New York Central Railroad passes through the region of Sleepy Hollow and the Catskill Mountains are just across the Hudson, so it is not surprising that slow-going travelers sometimes happen on the Central. A traveler boarded a train last month, however, who slightly surprised the conductor by handing in a stop-over check which was given to him 34 years ago. The conductor demurred to accepting the check, but the passenger insisted that his fare was paid through to Rochester and that the stop-over check was evidence of that fact and that the company was bound to honor it. The argument seemed to be sound and the conductor took the "relic" and the passenger settled back in his seat to enjoy the ride that had been due him more than a generation. We regret that we have been unable to find out what kept the man waiting over so long.

Car and Locomotive Painters' Convention.

The annual convention will be held at Washington, beginning September 9.

The following is the business of the meeting:

(1) Is there a chemically pure soap that can be safely used for cleaning the outside varnished surface of passenger cars while in service? Stating soap, results and method of cleaning. W. O. Quest, Pittsburgh & Lake Erie, Pittsburgh, Pa.; T. Bryne, Chesapeake & Ohio, Richmond, Va.; J. H. Speer, Western Railway of Alabama, Montgomery, Ala., committee.

(2) As a question of economy and durability, should rough stuff be discarded on the outside surface of a passenger car? If so, what materials and methods of application will best answer the requirements of this class of work, durability being the main consideration? W. T. Hogan, Atchison, Topeka & Santa Fé, Topeka, Kan.; A. R. Given, West Shore, Frankfort, N. Y.; A. J. Bishop, Cleveland, Cincinnati, Chicago & St. Louis, Delaware, committee.

(3) Can a new locomotive receive a durable finish in 10 days? Stating methods and materials used. A. J. Moriarty, Baltimore & Ohio, Newark, O.; A. S. Coleman, Intercolonial (Canada), Moncton, N. B.; J. H. Long, Chicago, Burlington & Quincy, Aurora, Ill., committee.

(4) The cleaning of varnished surfaces of coaches, locomotives and other outside work while in service, material used, modes of application, etc., by J. K. Lowry, Chicago, Burlington & Northern, La Crosse, Wis.

(5) As an associated body can we exert an influence on purchasing power that would remedy, where necessary, the quality of materials furnished? J. A. Gohen, Chesapeake & Ohio, Huntington, W. Va.; R. McKeon, New York, Lake Erie & Western, Kent, O.; A. T. Schroder, Chicago, Milwaukee & St. Paul, Milwaukee, Wis., committee.

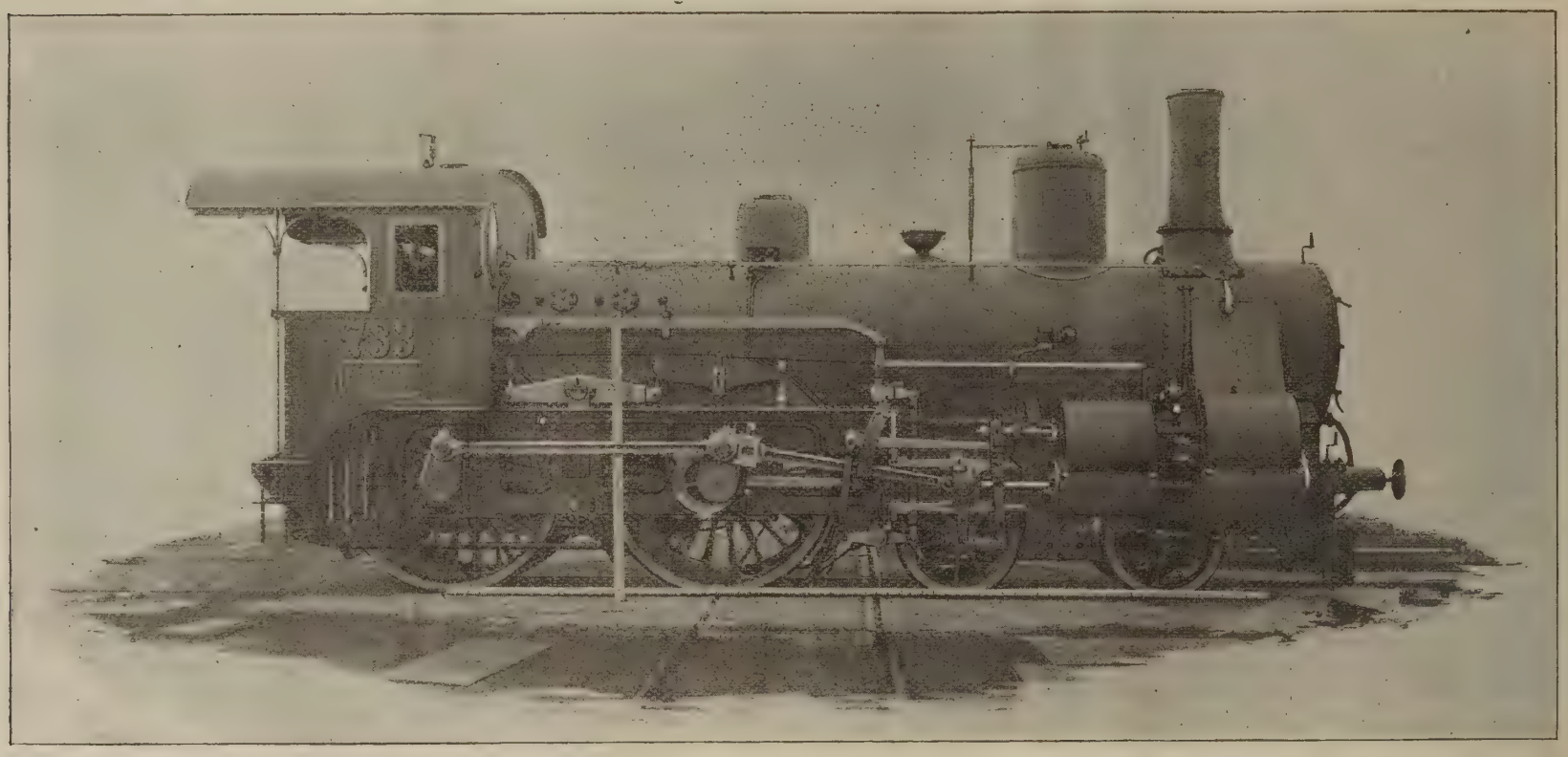
(6) How should the new wood head-lining material of a passenger car be treated to prevent the finished surface from becoming destroyed, from decay or filler, grain raising, etc., due to the interior heat and moisture of a passenger car? J. T. McCracken, Delaware Car Works, Wilmington, Del.; Edward Webb, Laconia Car Works, Laconia, N. H.; A. Campbell, Manhattan Elevated, New York, committee.

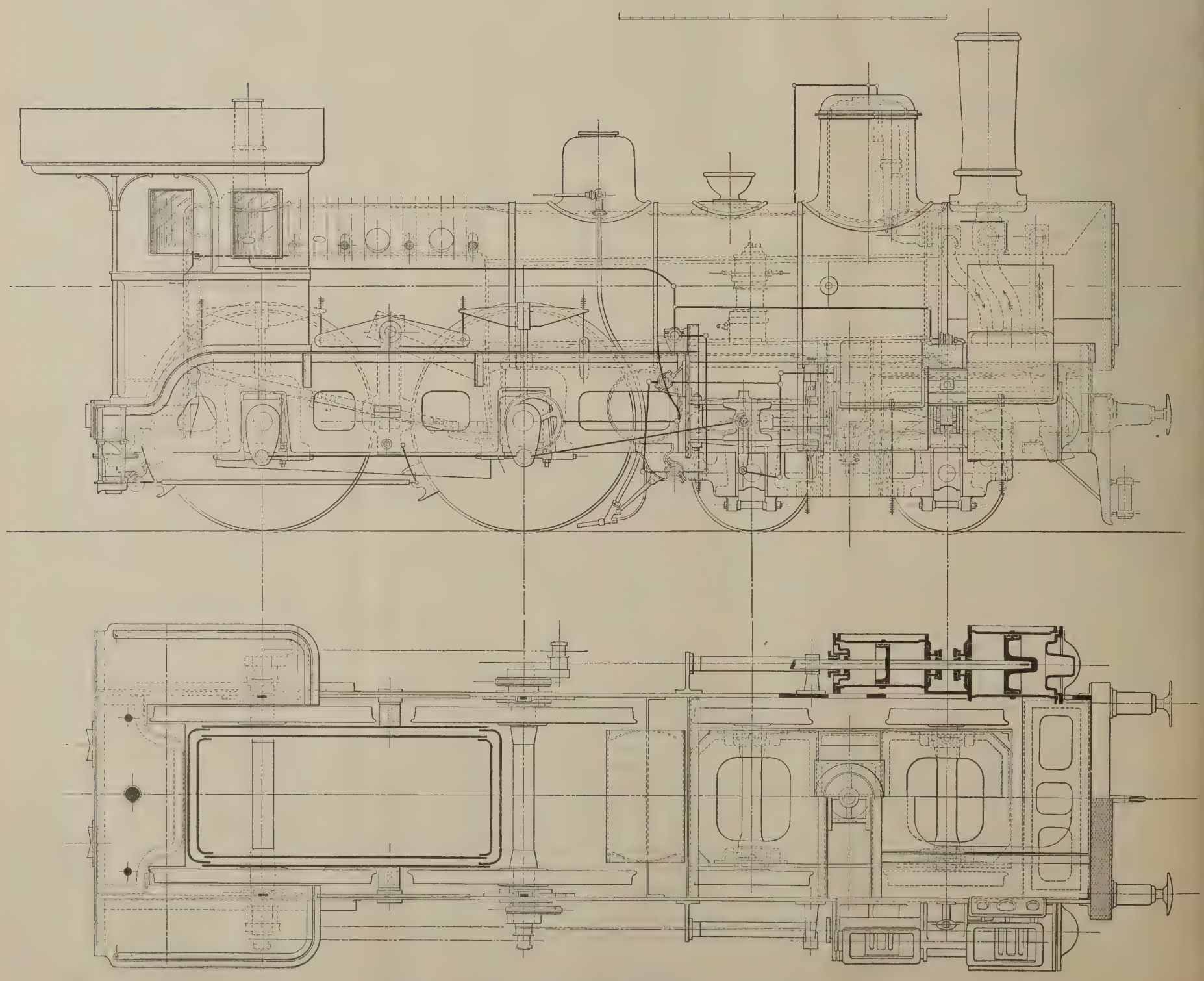
(7) Are railroad companies benefited through the Association of Master Car and Locomotive Painters? by Samuel Brown, Old Colony, Boston, Mass.

(8) Reports of committee of twelve appointed on geographical interchange of test panels, painted and exposed for a period of ten months in the extreme different climatic sections of the country.

TOPICAL QUESTIONS.

1. Would it be advisable to form a bureau of information in connection with our association? 2. Do you use all or part shellac on the hard-wood inside finish of passenger cars? 3. How do you prepare stack blacking for locomotives while in service? 4. What materials do you use and how long do you take to paint freight cars? 5. As an item of shop economy, in what manner can you keep paint stock and brushes in the most serviceable state? 6. What is the best formula for preparing floor paint for passenger cars? 7. What are your views concerning the piecework system for the railroad paint shop? Robert McKeon, Kent, O., is secretary.

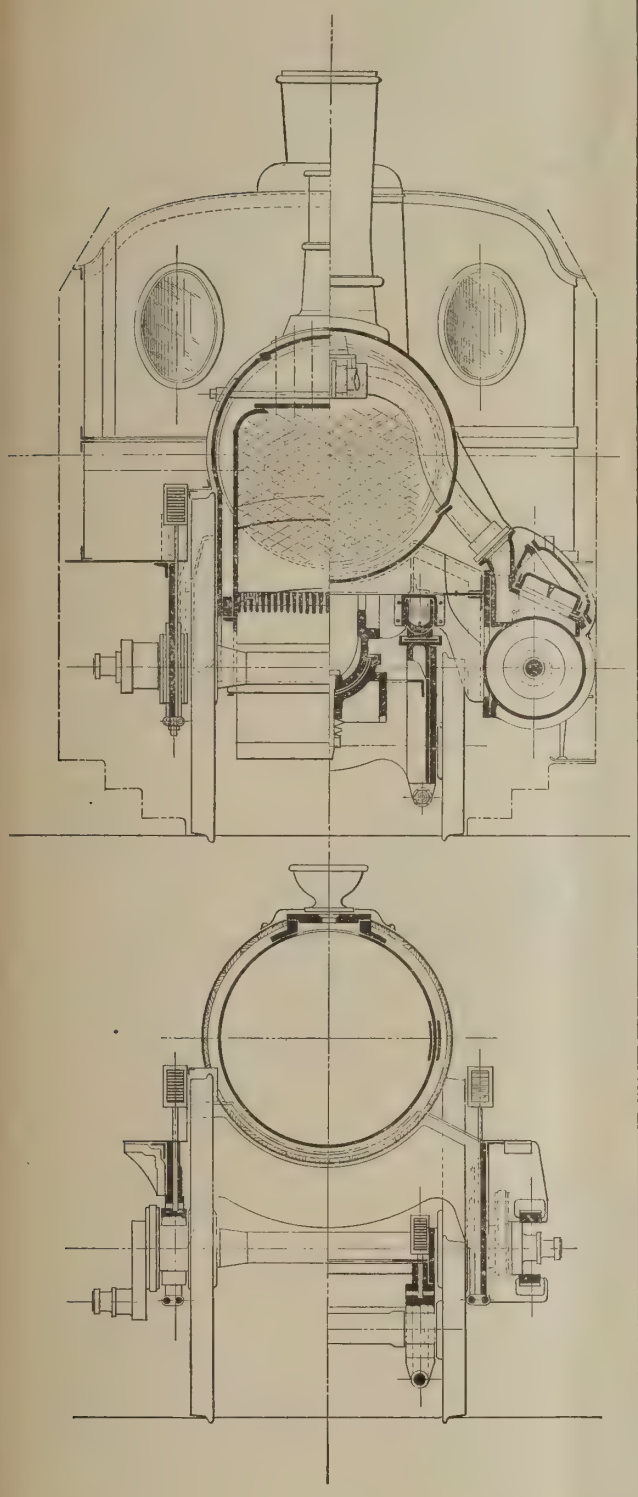




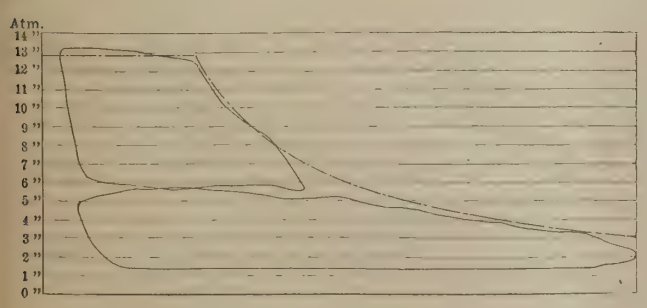
HUNGARIAN STATE RAILWAY'S COMPOUND LOCOMOTIVE.

Hungarian Compound Locomotives.

We are indebted to Mr. Victor Kun, chief engineer of the Hungarian State Railways, for the drawings and other data respecting the locomotive illustrated in the annexed engravings. Our correspondent says that after a new person tariff was introduced by Mr. Baross, minister of trade



and communication, the increase of passenger traffic be came so great that it was necessary to build new and powerful locomotives to handle the heavy trains. The Woolf compound shown was designed by Mr. Ligismond Cordina, chief draughtsman, and erected in the state railway machine shops, under the supervision of Mr. N. Forster, superintendent. The conditions laid down were the building of a locomotive capable of pulling a train of 160 tons at a speed of 50 miles an hour on a level, that the engine should not weigh more than 14 tons on one axle, that she should steam freely when fired with brown coal, which evapo-



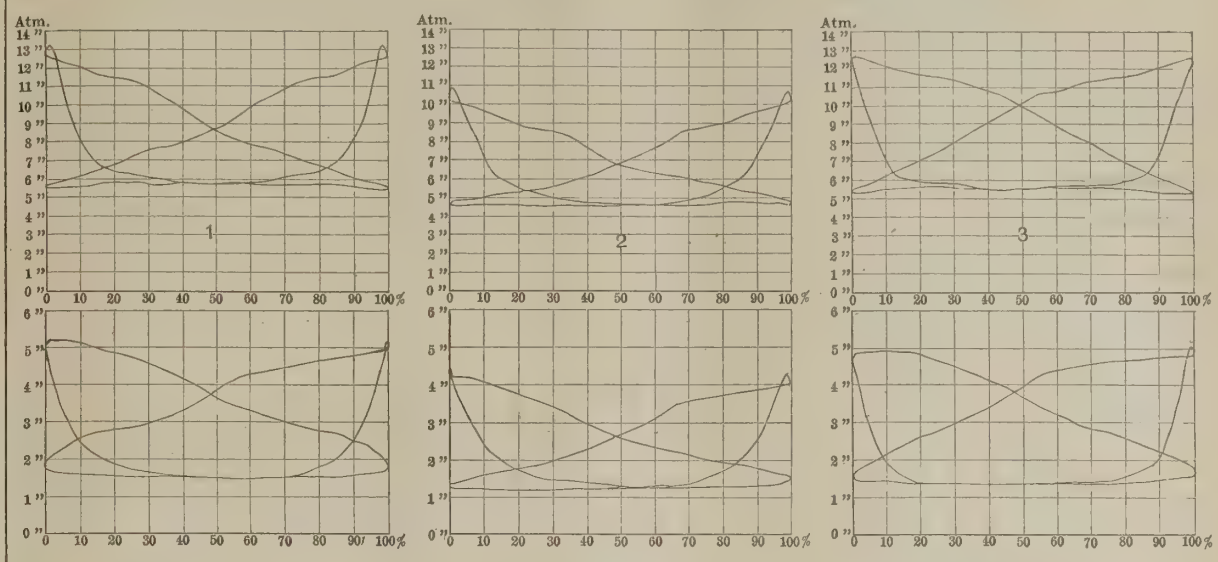
rates about five times its weight of water, and that the engine should be turned on a table 44.3 feet long.

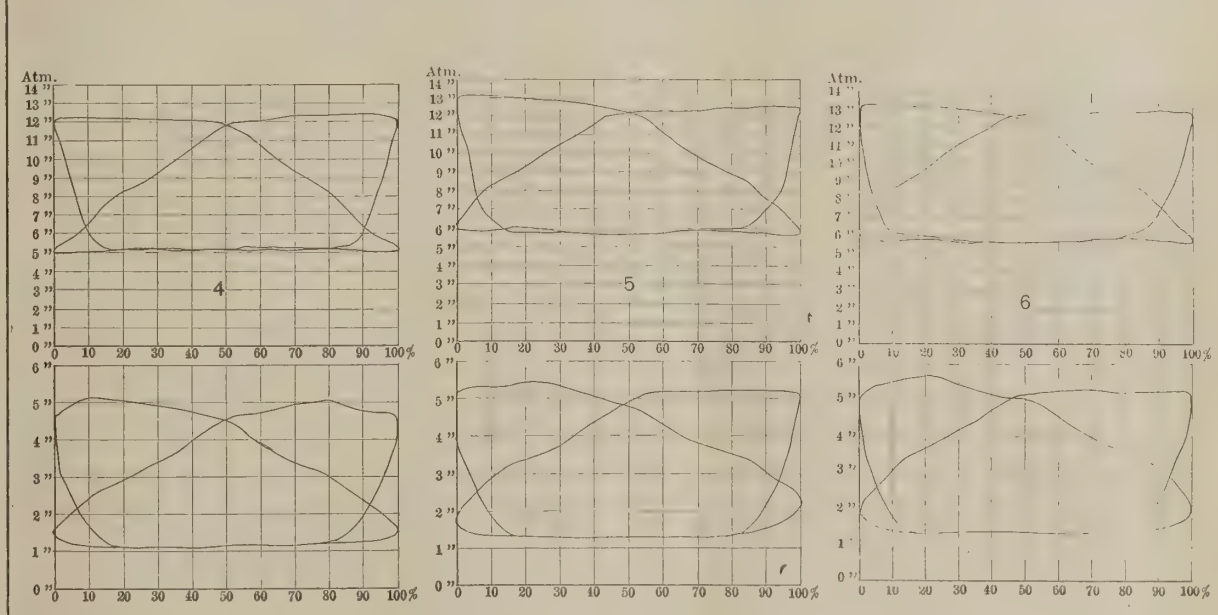
To attain these conditions the engineers responsible considered the Woolf-compound the best form of locomotive they could build. This type of engine has four cylinders, two on each side set tandem-fashion, with the low-pressure cylinder ahead, and both transmitting the power through one piston rod. Both cylinders are cast together. The high-pressure cylinders are 14.48 inches diameter, and the low-pressure cylinder 21.67 inches. The stroke is 25.6 inches. Driving wheels are 78.8 inches diameter. There is a receiver placed in the smokebox which supplies steam to both the low pressure cylinders. In starting live steam is admitted to the low pressure cylinders by means of a starting valve which is operated by the reverse lever, and admits steam of reduced pressure to the receiver. The valve motion is the Hensinger link motion, which is used on many of the locomotives on these lines. One valve stem operates both slide valves on the side of the engine. There is a sanding arrangement on the engine, which is operated by air from the Westinghouse air brake, and is said to be very efficient and convenient.

The engine is carried in front by a four-wheel truck, and the whole wheel arrangement is very much like that of eight-wheel American locomotives.

The boiler is made of Martin steel and the fire-box of copper, with soft steel stay bolts. The working pressure is 190 lbs.

Some trials were made to test the efficiency of the engine, and the annexed diagrams were taken during one of the trips :





INDICATOR DIAGRAMS.

No. of diagram.....	1	2	3	4	5	6
Boiler pressure (lbs.)...	181	173	176	169	181	181
Av. miles per hour.....	41.3	44	37.2	10.5	22.8	18.6
Av. press. in H. Pr. Cy.	38	26.4	50	70.5	72	78
Av. press. in L. Pr. cy.	18	17.6	28.4	38.2	42.6	44
Ind. H. P. in H. Pr. cv.	265	201	319	128	284	25
Ind. H. P. in L. Pr. cy.	440	306	430	159	385	323

Staybolt Specification.

A specification, as applied to "materials," may be defined as a concise statement of certain peculiar qualities which make such material safe and valuable for certain uses. A determination of these qualities is the result of prolonged observation in its practical behavior and study of its failures and the causes thereof. But it is obvious that service tests cannot always be employed to determine whether a material is fit for use, as we must know this fact before using it. We, therefore, strive to ascertain by quick methods of test the qualities developed ordinarily, only in the course of time; in other words, substituting indirect tests for direct. In so doing, there is obviously danger that we may rarely fail to identify a material completely from a recognition of one of its qualities only. To make the point clear by example: A satisfactory material for locomotive staybolt is commonly stated in specifications as one having a tensile strength of 50,000 pounds per square inch, and an elongation in such test of 28 per cent., with the additional provisions that it shall cut with a good thread and have its fracture free from lamination. A good quality of well worked muck bar iron will fill these conditions, and so will many grades of "mild steel"; but the latter material will appear, form results obtained in the testing machine, so vastly superior in uniformity and the exceptional combination of high strength with great ductility, that, on the sole assumption of rigid adherence to the conditions specified, an expert would not fail to predict superior practical results from the steel. In point of fact, we know that so far steel has proved a complete and absolute failure for staybolt purposes. It is, therefore, manifest that our specifications are likewise a failure, unless limited to call for iron. We have neglected some important practical feature, some quality possessed by iron and not developed yet in steel. Now, the above is not to be taken to imply that a steel will not ultimately be found suitable for staybolt purposes, or that when found a specification cannot be framed to completely identify it and to exclude unsuitable grades, but simply to show that we have not completely described the essential qualities of a staybolt material in the few clauses of our specification; the term "iron" alone embraces a list of pecular qualities, some useful and some not, and we are taking too much for granted in assuming without investigation that a new material possesses the unnamed essential properties in the requisite degree.—*Report on Laboratories.*

The Baldwin Locomotive Company have a contract for building the power for the Chicago South Side Elevated.

The Chicago & Eastern Illinois have finally decided to have the 12 new coaches built at once after postponing the matter several times.

In some of the establishments kept open for the accommodation of railroad men by the Young Men's Christian Association there are two kinds of members. To be an active member a man must be a church member; but as there are comparatively few trainmen greatly given to church going, the greater part of those who support the railroad reading rooms are called associate members. They simply pay their annual dues and take the privileges of the place without having any say in its management. The Kansas City *Signal* says that the associate members have been the most valuable supporters of the reading rooms and is anxious to know why.

Growth of the Car.

Nature has supplied man with means of locomotion that can take him unaided over the earth at the rate of four miles an hour. Compared with modern artificial means of locomotion this rate of speed is slow. There was a time when a man's pace was in keeping with the most rapid method of transit, but using one's legs as a means of progression seems never to have been popular, for inventive genius from the earliest times appears to have been directed to the scheming of plans for saving people from the exertion and fatigue of walking. We have no direct evidence that man during the primitive gardener period of existence called in the aid of less cunning creatures to carry himself and his rude "mattocks and spades," but as far back as human records go, we find the lords of the earth harnessing the more docile animals to bear his burden. He who first mounted the back of the fiery cow, the first animal to be mounted, was no doubt a hero worthy to lead his race. From steeds of the cow-kind the line of progress went by way of donkeys of low and high degree to the horse, camel and elephant, which may be considered the limit of animal locomotion.

It is sad to reflect that the arts of peace have received the most progressive impulses from the arts of war. But for the development of the art of molding in making cannon, the skill to cast a steam cylinder might never have been reached, certainly not for centuries to come. The ancients were evidently satisfied with the means of inland transportation obtained by the backs of animals, and wheel carriage would never have been introduced had some aggressive war chief not seen that his men could do more effective fighting rushing against their enemies on a wheel-carried platform. The war chariot was the precursor, at a long distance, of the coach, while the coach prepared the way for the modern car. The American word car is crowding out the word coach and carriage from all English speaking people, yet when a wheeled vehicle was first used in peace for carrying persons it was called a car.

The earliest record found of a carriage proper being used was when Charles of Anjou and his Queen entered Naples in 1280 riding on a caretta. When an imitation of this article of supreme luxury was first seen in England the word caretta was shortened to car, but under the Norman sway it was Frenchified into chariot or coach, the latter word a corruption of the French word *coucher*, to recline.

Through long years of development the rude, springless, wheeled box grew into the comfortable covered coach carried on steel springs or leather thongs that supplied the first car body for the railroad era. The luxurious ideas that first demanded elaboration of the carriage took the form of highly ornate carving and heavy gilding. The ancient specimens of the carriage makers' art, still preserved in the museums of Europe, are wonders only for the laborious efforts that had been devoted to making them costly possessions.

The carriage originated in a form similar to that of the primitive locomotive cab. It was a small canopy, supported by four pillars with curtains for side protection. It was not till after Queen Elizabeth's time that glass was used as a comfort and protection in carriages, although very ornate trappings were attached to them before that period. In the time of Charles II. Pepys notes in his famous diary that on "May 1, 1665, after dinner I went to the tryall of some experiments about making of coaches go easy, and several we tried, but one did prove mighty easy (the whole of the body lying on one long spring), and we all, one after another, rid in it, and it is very fine and likely to take." That is the first authentic account of a decided improvement in the arranging of carriage springs, but they had been used in a crude form previously.

The arrangement of springs mentioned by Pepys was probably only fine by comparison, for after the middle of the 18th century springs were not used except for the more luxurious style of carriage. A French writer of that time mentions the application of springs to the four corners of a perch carriage. The springs were fastened to upright posts, and leather braces went from the top of the springs to the bottom of the body, causing excessive swinging, jerking and tilting when the vehicle was in motion.

Toward the end of the last century carriage building became one of the most perfected trades in Europe. A carriage that was used by the Emperor Napoleon during part of the Russian campaign is preserved in a London museum, and it is a model of convenience, comfort and strength. The French Academy of Arts encouraged the best of work in the carriage-building trade and the vehicles built would have compared favorably with the work of to-day.

When efforts were first made to apply steam to the propulsion of carriages on common roads the carriages used for the purpose were models of strength and lightness. The carriage was in no way to blame for the failure of that method of locomotion.

The first passenger cars used on American railroads were road-carriage bodies placed on flanged wheels. The pioneer American railroad men, not being hampered by the necessity for adhering closely to past custom, soon discovered that the coach that was the best form for common roads was not best adapted for railroads, and a suitable type was worked out. The European countries that received their patterns of railroad rolling stock from England had the enlarged road coach put upon them for a railroad carriage, and they are only now beginning to work their way into fit forms.

The Making of Malleable Castings.

A visit to the works of the Cleveland Malleable Iron Works at Cleveland, O., gave me some genuine surprises in witnessing the extent to which this industry has been carried. The extent of the works is enormous and they appear to supply articles for nearly every industry in the country. Hundreds of things that most people have been accustomed to consider as being forgings of iron or cast steel I found on going through these works to be malleable iron.

It is probably the fault of those who are engaged in making malleable iron castings that there is such a widespread misunderstanding of what malleable iron castings are. Many people who are in a position to order malleable iron where they consider it suitable, are under the impression that this material is a common casting, subjected to an annealing process that increases its toughness in proportion to the time and care bestowed upon the annealing operation. If those interested in selling malleable iron would take the mechanical world more into their confidence there would be less prejudice against the material.

DISCOVERY OF THE PROCESS OF MAKING MALLEABLE IRON.

Some seventy years ago there lived in Newark, N. J., Seth Boyden, a blacksmith by trade, who became a sort of Admirable Crichton in every thing relating to the mechanic arts. This man, besides possessing great inventive and mechanical ability, had extraordinary acuteness of observation. When yet a lad he saw that a grate bar which was taken out of a furnace had apparently changed its quality on the part exposed to the fire. He broke off the part that appeared to have undergone metamosphosis, and found that it could be drawn on the anvil. By some unknown process the cast iron had become malleable. Boyden proceeded to search for the secret of the change. All his spare hours were devoted to the search, and after long and tedious experiment he found out that when cast iron of a certain quality was kept at a high temperature surrounded by oxide of iron, the cast iron lost its high percentage of carbon, and became soft and malleable. Unless the proper mixture was used in the cast iron, cementation made the iron worthless.

The great malleable iron industry that can be seen operating on such a large scale in the Cleveland Malleable Iron Works is part of the outcome of Boyden's discovery. Until a few years ago, there was scarcely any malleable iron used in railroad machinery, but its introduction into this line has gone on very rapidly. Ten years ago when Mr. George W. McGuire joined the Cleveland Malleable Iron Works, only a few tons of their product went to railroads. Last year over 10,000 tons of these castings were made for railroads, and the demand for this material in drawbars promises to double the supply for railroads in the current year.

The castings are made in dry or green sand molds that do not differ materially from ordinary cast iron molding. The iron is poured very hot and the product is a shiny, gray, highly brittle casting, these characteristics being principally due to the selection of pig iron. The castings are then taken and put into square boxes where they are imbedded in oxide of iron, mostly in the form of iron scale purchased from rolling mills. The boxes are put into furnaces and gradually raised to a high temperature, the limit being only short of the melting temperature of the iron under treatment. The higher the temperature maintained, the better the product. The boxes are kept in the furnace seven or eight days and then allowed to cool slowly. As soon as the castings can be handled they are ready for cleaning.

There is considerable difference of opinion among metallurgists as to the rationale of the process. The prevailing opinion is that the decarbonizing material, when kept at a high temperature, removes from the part of the iron penetrated the carbon, sulphur, silicon and manganese by a process of oxidation. An eminent chemist, however, who has given the subject profound study attributes the change in the physical properties of the castings after treatment to the separation of amorphoris graphite within the metal, without which separation he holds that the castings will remain brittle when the amount of carbon is decreased to the usual extent. Be this as it may the practice of cementation with oxide of iron on the proper castings produces a very tough casting that is filling a highly important place in American industries.

A. S.

Dangers of European Cars.

My experience of railway travel in Europe, says Mr. Chauncey M. Depew, which, by the way, has been quite extensive and varied, has firmly convinced me that no railway company in the United States could run trains on the European plan and retain its charter. The whole system throughout Europe seems to me to be simply a system of barbarism that smacks strongly of the Middle Ages, and I will tell my readers why I think so. In the first place, no one is safe in the small compartments of their railway conveyances, which we would call cars, but which they denominate "carriages." In one of these little compartments you are left alone with several utter strangers, perhaps only two or three, and often but one. Now that one may be a thief, a lunatic or even a murderer, with the others as his confederates. Under such conditions, then you are shut up in a miserable, detestable box for an hour or more, while the train, rolling and thundering along, drowns any cries that you may make in case you should be attacked. The signal bell is out of reach, and if you are unarmed or doze for a moment you are quite at the mercy of any villain whom the railway company may have forced you to unwillingly accept as your traveling companion. Fortunately, the evil consequences are not so great in Europe as they certainly would be in the United States, for among Europeans the criminal classes seem to be less daring than with us. But even as it is, robberies, murders and assaults are so frequent on Continental railways as tor convince any fair-minded person that men travel in Europe at the risk of their lives and women at the risk of their honor.

Another Two Story Locomotive.

To the average engineer one set of driving wheels seem to be sufficient for an ordinary locomotive, and modern engines are getting very highly elevated while resting on the drivers that run on the rails, yet there is great hankering among certain inventors to have locomotives built with driving wheels on the two-story plan. Since the Fountaine locomotive of short lived operation went to the scrap-heap there have been several attempts to repeat the principle on slightly different forms and now we have Paul Seiler of San Francisco, patenting another locomotive with two sets of wheels, one mounted in vertically adjusted boxes and traveling upon the track and the other set, of the same diameter, journaled to travel upon the peripheries of the lower set of wheels, journal boxes in which the axles of the upper wheels revolve and upon which the weight of the engine is carried and transmitted through the upper wheels to the peripheries of the lower wheels, and cranks and connecting rods whereby the upper set of wheels are united together and connected with the cross-head of the engine, so that power is applied directly to the upper set of wheels.

This is all very ingenious, but the lesson of these inventions is that too many of our people are utterly ignorant of the principles of virtual velocities and of mechanics generally.

Increase of Compound Locomotives.

The appearances are that the committee of the Master Mechanics' Association having the work of investigating the merits of compound locomotives will have ample data about these engines to draw from before the year is out. The Baldwin Locomotive Works intimate to the committee that they have 17 compound locomotives in the erecting shop. The Schenectady Locomotive Works have eight compound locomotives at work in different parts of this country. Besides this they are building four 10-wheel passenger and one 12-wheel compound for the Southern Pacific. The Rhode Island Locomotive Works have three compound locomotives at work, the Brooks Locomotive Works are about to deliver a compound to the Lake Shore & Michigan Southern, the Pittsburgh Locomotive Works are building one compound, the Chicago, Burlington & Quincy people have one at work, and the compound locomotive that the Old Colony people have been building in their shops at Boston is almost ready for trial. All the compound locomotives built in this country except the Baldwins are two-cylinder engines.

A New Metal.

A recent press dispatch from Pittsburgh says: A series of experiments by Thomas Harrington, of this city, into the properties and uses of nickel-steel and manganese bronze has resulted in the discovery of a new metal. The chief characteristics of the metal are that it obtains a high tensile strength, is indestructible by corrosion, being impervious to acids, and that it can be wrought into spikes, nails, etc., while either hot or cold. The attention of the Government being drawn to this metal, Commander W. M. Fowler, of the Bureau of Ordinance, instructed Lieutenant Cowles, the naval instructor at Homestead, to inquire into the subject. He did so, and has made an exhaustive report to the Bureau on the subject.

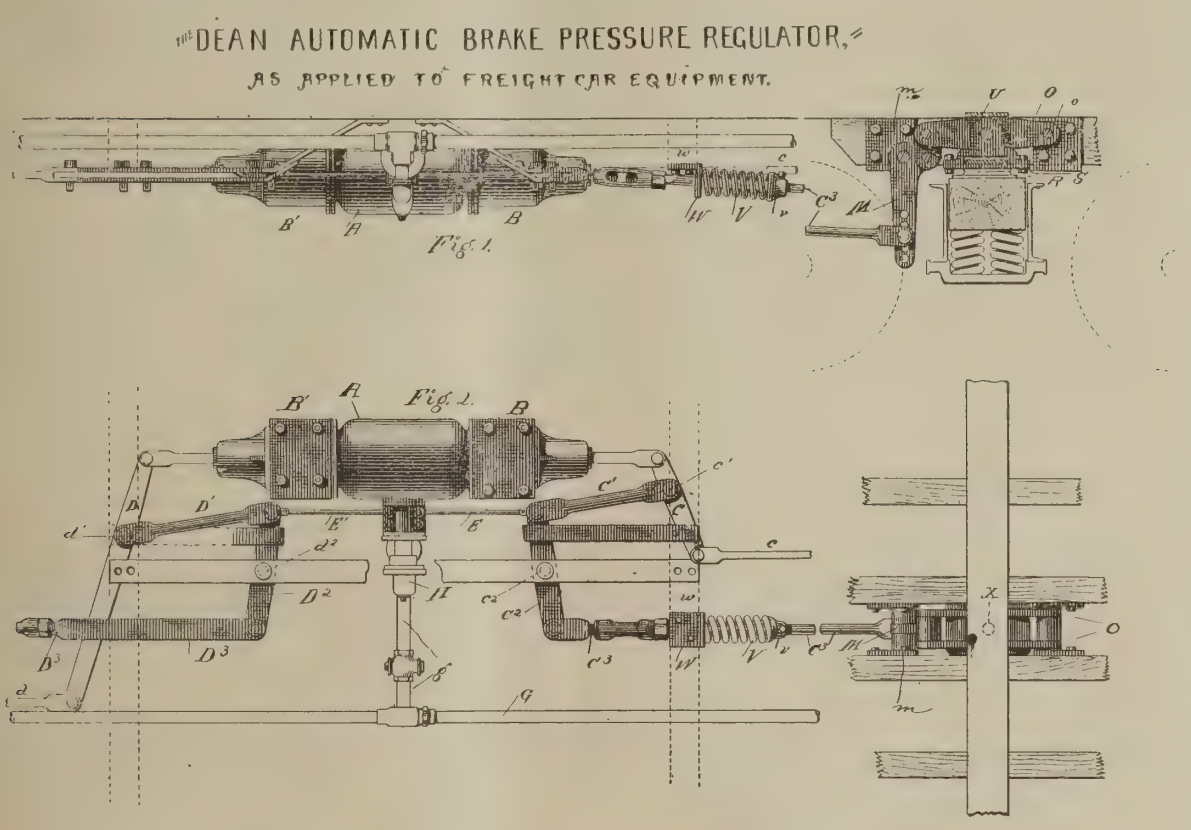
When a grind-stone is new and 4 feet in diameter, 10 inches is none too thick; but when that stone wears down to 24 inches it should be split. It is too clumsy, but will make two nice stones if carefully split. To do this turn a deep groove in the stone before it is removed from its hanging. The groove should be 3 inches deep and ¾ inch wide outside, tapering to as narrow a line as possible to be made at the bottom. This groove done, the shaft and collars removed, the groove is driven full of dry pine wedges. Put them in carefully, all equally tight. Throw the stone into water, let it lie overnight and it will split nicely.

The Dean Automatic Brake Pressure Regulator.

"It is of the utmost importance that the braking force applied to the wheels of a car should be proportionate to the weight of same on the rail under the wheels, to which the brake shoes are applied."—*Westinghouse Instruction Book.*

It is a well known fact that under the present brake system, as applied to freight cars more particularly, the braking force is necessarily limited to a percentage of the weight of the empty car; 70% of this weight having been adopted by the M. C. R. Association as a standard. It is also well known that when a freight car is loaded to its maximum, the weight on the rail is increased in a ratio of about 3 to 1, while at the same time the braking force remains the same, or in other words, the weight on the rail is greatly increased without any increase of braking force.

The number of wheels spoiled by sliding demonstrates beyond a doubt that this percentage is too high for all conditions of rail, for empty cars, while at the same time it is far too low for heavily loaded cars, where emergencies require that the train be stopped as soon as possible. A "break in two" collision is liable to result under the present system on down grades, where trains are made up with the loads in the rear and empties ahead, the braking force being the same on each car of the train, the loads crowd into the empties. To remedy such difficulties the Dean Automatic Brake Pressure Regulating Device, illustrated in the annexed engraving. has been especially designed, although it may be used to advantage on passenger equipment cars as well, as it is claimed for it that a more even stop may be made by its use. It is also claimed for this invention that the braking force is absolutely regulated by the weight on the rails, under each end of the car, independent of the other and regardless of the manner in which the loads may be distributed, the weight itself automatically determining the braking force. Any percentage of the weight on the rail may be used as braking power as practical demonstration may determine shall give the best results under all conditions of rail.



In this invention one triple valve, an auxiliary reservoir and two brake cylinders are employed, each brake cylinder being connected with the brake apparatus on one end of the car, also two devices for lifting its respective end of the car body, and a governing valve which is automatically set in operation upon the lifting of one end of the car body, and serves to shut off the air from the brake when the pressure reaches the desired degree. Another feature of the invention consists in applying to the lifting devices an artificial resistance which is adjusted so as to be about equal to the weight of the truck. This combination is so adjusted that when the pressure upon the brake reaches the maximum point allowable, the end of the car body will be lifted slightly, and at the same time the air is cut off from the brake cylinders.

In the accompanying illustrations, Fig. 1 is a partial side elevation of a car to which this invention has been applied. Fig. 2 is a plan view of the same. In the engravings A represents the auxiliary reservoir of the brake apparatus, and in the construction shown is employed with the reservoir a separate brake cylinder for operating the brake and lifting apparatus at each end of the car. These cylinders are shown at B B^1 and may be located at the opposite end of the reservoir. The piston of cylinder B is connected with the braking devices at one end of the car by lever C and rod c, and the piston of cylinder B^1 is connected with the braking devices at the other end of the car by lever D and rod d. The lifting devices, which are located at the center pins of the trucks are connected to and actuated by the levers C and D as follows: In the case of the lifting device, as illustrated at the right end of the car, the connections consist of the link C^1 and lever C^2 pivoted to a stationary point c^2 at its center and rod C^3 extending to the lifting devices, the lever C^2 being jointed to both link C^1 and rod C^3 and the link being pivotly jointed to C at c^1; at the other end the lever D is pivotally jointed to link D^1, at d^1 said link is joined to a swinging lever D^2 pivoted centrally at a stationary point d^2, and the lever is jointed to the rod D^3 extending to the lifting devices. In this construction it will be noticed that the pivot c^1 and d^1 will remain stationary until the pressure has become great enough to swing the lever C^2 and actuate the lifting devices and that until that time the pivots c^1 and d^1 act as stationary fulcrums to levers C and D, and that when these levers swing and actuate the lifting mechanism, the joints between them and the brake rods become temporarily the fulcrum points. Each brake cylinder is provided with a governing valve which is mechanically connected to the lifting mechanism, or preferably to some portion of the lever system by which power is carried from the brake cylinders to that mechanism, and in the illustrations these connections to the valves consists of the rods E joined to one end of the lever C^2 and rod E^1 joined to lever D^2. The valves which were indicated at F and F^1 are each provided with crank arms f f^1 and such arms are joined to the rods E and E^1.

In the air connections G is the main train pipe, having a branch g; this branch g opens into the triple valve casing H, which is of the usual construction. From the triple valve the air is fed to the reservoir, and in entering the brake cylinders it passes first through a port into a chamber in which are located the governing valves, already referred to. These valves are similar in construction and are preferably plug valves made hollow with lateral openings, which register with air passages and leading to the respective cylinders; each is operated by its crank arm and the mechanical connections described.

The lifting devices consist of the following: The rods C^3 and D^3, which are actuated from the brake lever as already seen, are each joined by an elbow lever M pivoted to the car frame at m; a link connects lever M with one end of a lever or a pair of levers O, stationarily supported upon the pivot o, projecting from the car frame. Located centrally between the ends of lever O and jointed thereto by pivots is a supporting block which is recessed vertically to receive the center pin X of the truck, and is bolted at its end to the center plate S, which rests upon a corresponding plate R, secured upon the truck beam. The center pin also passes through an enlarged opening of the usual transom iron, which passes under a block, and another transom iron also passes over the block. The lower end of the lever M is provided with a series of openings m' for the attachment of the rods C^3 and D^3, which enable the throw of the lever to be varied to suit circumstances.

Upon each of the rods C^3 and D^3 is shown a resistance spring, confined between a collar on the rods and a suitable opposing bracket located upon or supported from some stationary part of the car, as, for instance, the cross-beams w. These springs exert a resistance upon the rods C^3 and D^3 equal to the weight of the truck upon the tracks, and hence in effect they add the weight of the truck to the weight of the car, and such united weight must be overcome before the lifting takes place and the governing valve is closed.

With this construction the operation is substantially as follows: When it is desired to set the brake, the pressure is reduced in the train pipe and triple valve in the usual manner, the air from the reservoir then charges the two cylinders and actuates the pistons thereof to set the brakes. The pressure thus put upon each may be continued until it becomes great enough to overcome the resistance caused by the weight of one end of the car and until the resistance of spring V, at the same end, is also overcome; the brake lever will then move so as to carry link C^1 or D^1 and swing lever C^2 and D^2, giving motion through rods C^3 or D^3 to the elbow levers M, located at the end of the car, when the resistance is overcome. The swinging movement of lever M thus imparted depresses the link N and the end of levers O, to which said link is attached. The further end of levers O are thus caused to rise and lift the car body, acting in so doing as levers of the first kind with the pivot q as a fulcrum. Inasmuch as pivots q are sustained from the truck by plates S and R and block Q, it will be seen that the body of the car will rise slightly under the lifting action of levers O. The lifting can be very limited so far as the extent of the movement is concerned, and it is only requisite that at the time the resistance is overcome the governing valve at the end of the car, which may be lifted, shall be closed so as to shut off the surplus air pressure from the brakes. In the construction given in the illustration this is done by the rod E. The operation described will occur simultaneously at both ends of the car, if they are equally loaded; but if unequally loaded, then it will occur at the lighter end first in point of time; each brake mechanism in this construction is independent of the other, and should either become disabled the other may still be used.

Changed Practices on the Baltimore & Ohio.

A change of sentiment appears to have come over the Baltimore & Ohio. This is about the oldest railroad in America. After giving to the country some practical illustrations that a new era in methods of transportation had arrived, the men in control seemed all at once to become paralyzed with their own enterprise and audacity, and made up their minds to show no more of it. For about half a century the railroad was managed on the lines of certain antiquated aphorisms, the principal one being "leave well enough alone." The mechanical department was dominated by an article of the company's moral law, which read, "never put in the scrap heap anything that can possibly be made of use."

It was no wonder that the Baltimore & Ohio became synonymous with something exceedingly ancient and worthless.

This condition of affairs has changed now, and people have got voices in the company who are not only ready to raise them in favor of progressive practices, but also to use them in proclaiming to the world that the Baltimore & Ohio will no longer be tamely left by its competitors. The laws of the Medes and Persians were flexible compared to the rules of this company forbidding the giving out information to the press. Now those in charge seem to invite publication of what is going on in the shops and among the various departments. The stronger the talk about the merits of the company's machinery the better it is liked. The practice of the company, too, is beginning to justify praise, for everything purchased, cars, locomotives and other machinery, is the best of its kind.

Running Boards on Switching Engines.

The Supreme Court of Iowa has decided that a brakeman who works with a switching engine that has no running board and makes no complaint of the danger is guilty of contributory negligence if he gets injured. The following are particulars of the decision:

The proper person for a brakeman working on a defective switch engine to make complaint to is the yardmaster, even though the latter has no authority to order it repaired, but must report complaints to the trainmaster. If, by any acts or expressions, a brakeman gives the proper agent of the railroad to know that he is unwilling to continue in the employment without running boards on the engine, it is a sufficient complaint. And, now, if that agent, by any acts or expressions, gives the brakeman reason to believe that running boards would be furnished for the engine, or that an engine would be furnished for the work with running boards at some future time, and the brakeman is induced thereby to continue in the employment, then the railroad company will be held to have assumed the risks incident to the performance of the work without running boards until such boards shall be furnished. But when the brakeman knows there are no running boards on the engine and continues in the employment without complaint, or if, having complained, he continues without assurance from which he has a right to believe that they will be furnished, then he himself assumes the risks incident to the work without running boards. The mere fact that a brakeman does not think it imprudent to step between a moving car and engine to couple them will not relieve him of contributory negligence if he does not have good ground as a reasonably prudent man for doing it. The condition of the track, the presence or opportunity to do the work at a different time or in a different way with greater safety, and all other circumstances throwing light on the question, must be considered as determining liability.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

TAPERS AND FITTING OF BOLTS.

When Mr. William Swanston, as chairman of the committee of the Railway Master Mechanics' Association was investing the subject of Standards of the Association, he discovered that there was great confusion in the practice of tapering bolts for frames and other important parts of locomotives. This is a detail of construction which commends itself as a standard of the Association, and the educational effects of establishing such a standard would be of the most valuable kind. A committee has been appointed to investigate the subject and the likelihood is that needed light will be thrown upon the whole subject of fitting bolts and other parts dependent upon accurate fitting to secure solidity.

The bolts in a locomotive performing the most important functions are those that secure the cylinders to the frames and those that secure the frames together at the joints. There is no more common defect about a locomotive than to find some of those bolts loose, and there are few defects likely to lead with more certainty to serious breakage entailing expensive repairs. When a bolt gets loose it is nearly always evidence of bad fitting or wrong form. Information on the form and method of fitting bolts that give the best results in service will be of great value to railroad companies. To turn close-fitting bolts with a certain amount of taper is now considered a necessary practice among locomotive builders and those who look after the maintenance of the engines. In this respect locomotive practice is different from that of other machine trades, but experience has shown the taper to be essential, for the reason that all locomotive bolts have to be driven out some time in making repairs. The question of taper or no taper has been very well discussed by Dr. Coleman Sellers, who said: "No round piece of iron can go into a round hole in another piece of iron unless it is smaller than the hole into which it is intended to go. If it is in any degree larger it must compress the plug itself or stretch the material that is around the hole. So if we adopt a tapered bolt we cannot fix upon a certain uniform distance that each and all bolts shall stand out before we begin to drive them. If the material is to be compressed there is a great deal more material capable of being compressed in a bolt of large diameter than in one of small diameter. Metal is elastic. As long as we keep within the elastic limit of the metal we are safe in assuming that it acts like a spring. In the large bolt and in the small one we have springs of different lengths. In the large bolt we have a long spring, and in the small bolt we have a short one If we drive a bolt into a large piece of iron it is the bolt which we compress; therefore, the larger the bolt the more pressure we must give it to produce the required result. Therefore, with tapered bolts discretion must be used, or elaborate experiments be made to show how far we should let the head stand away from the work before beginning to drive it. . . . When a tapered bolt s driven in and proves to be too loose, we have merely to urn it a little under the head and drive it a little further to secure a tight hold. That is another advantage in using tapered bolts, their use rendering it easier to repair work that is secured by them than work that has straight bolts."

In some railroad shops and among the old-fashioned builders various tapers for bolts are still in use, the practice varying from $\frac{1}{32}$ to $\frac{1}{8}$ inch to the foot. But all the important locomotive builders that are inspired by advanced ideas have adopted the uniform taper of $\frac{1}{16}$ inch to the foot for all frame and rod bolts. Not only has this become a standard practice, but the method of fitting the bolts has become uniform, based on the best mechanical means for securing uniform size in the fittings. The method of manufacture produces interchangeability, and the production of the finished work at the least possible cost. A modification of the system adopted to repair shops is badly wanted by railroads, and the committee will perform an important service if they make it clear to the association how the reforms may be effected.

It is sad to relate that in the vast majority of railroad shops the manufacturers' systematic method of making a hole to a gauge and putting in it a bolt also made to a gauge, has never been heard of. The prevailing practice grew up in imitation of the work of the carpenter who made windows to fit the holes that were left in the walls by workers in brick and mortar. The carpenter now uses interchangeable sashes, but the machinist doing locomotive repair work has not yet attained this extent of trade progression. A machinist finds that a bolt in a rod or in a frame is loose and that a new one must be put in. If the hole be out of round he reams it nearly true, and goes to the man on the bolt lathe and tells him that a bolt of an approximate size is wanted for the rod or frame. This man turns a bolt to something near the size shown by the calipers and then makes a journey to the engine to see how near the bolt fits. Then he returns to the lathe and takes a cut off the bolt sufficient to make it fit the hole and then tries it again. The number of times the bolt will be tried before it is put in to stay will depend on the skill of the lathesman, and on how he feels about making journeys to the engine. It does not require a feverishly progressive spirit to perceive that this is a slow way of doing work. Modern practice calls for the use of a gauge of the same size as the reamer used in truing up the hole, the gauge being the lathesman's place for fitting instead of the real hole. There are various plans by which this system of gauges for repairs is operated. Some of them are admirable, others are not so good. But it is an exceedingly bad substitute that is not better than the to and fro, between lathe and engine plan.

INFERIOR HELP IN PLANING MILLS.

The makers of steam engines are constantly complaining about the injury done to the reputation of their products by the prevailing practice of employing cheap and incompetent help to run the engines. Makers of all tools have good cause for like complaint, but those who suffer most at present from ignorance and incompetence are the makers of wood-working machinery. As the number of wood-working establishments keep rapidly increasing, the want of competent, intelligent workmen capable of caring for the valuable wood-working machinery is severely felt. This want is particularly noticeable in the South at present, for the increase of wood-working factories in that section has been decidedly in advance of the training of good workmen. Railroad companies are severe sufferers for the want of the right men to place in charge of the expensive machinery provided for the planing mills. We have no sympathy with the tribulations of the ordinary steam user who has to pay the damages caused by incompetent engineers, for delays from a damaged engine or a burned boiler are the inevitable results of employing cheap ignorance where skill can be purchased for fair wages. The users of wood-working machinery are many of them in a different position from most steam users, for men with the proper training to care for the expensive machines in use are not to be procured. An engineering visitor seldom goes through a wood-working shop in some quarters of the country without being asked for advice as to how competent men might be obtained to run the more complex machines in the planing mill.

After giving considerable attention to this subject we have concluded that the principal part of the scarcity of the kind of men needed is due to the master car builders in charge of the railroad shops concerned and of the proprietors of other wood-working establishments. Wood-working workmen are noted for remaining but a short time in one place. They are said to have no love for or interest in the work, and are always ready to accept other employment. There is nothing particularly unhealthy or dangerous in the work of a planing mill to make men indifferent about remaining at the occupation, and workmen do not habitually desert jobs without a cause. An investigator into this case naturally asks where in the wood pile is the son of Ham? The answer is not far to seek. The name of the satyr is low wages. The man who does the work on a wood-working machine is not necessarily a carpenter, and the skill of a machinist is not essential for keeping the tool in proper working order. When the workman is neither a carpenter nor a machinist, the conclusion is jumped at that he must be merely a laborer, and that he ought to be paid accordingly. It is surprising how quickly employers of labor can perceive the validity of reasons for paying low wages.

The preliminary process toward straightening out the difficulty with want of satisfactory help in planing mills is to recognize that wood working by machinery is a trade, and that the men so employed are entitled to be treated like other tradesmen. If fair wages were paid for the character of the work done, staying men would be attracted to the business. Where competent workmen are scarce we strongly advise the employers to raise the pay, and select for the best positions the smartest and most intelligent young men they can find ready to accept the jobs. In connection with this plan, the employing of a foreman with sense and good judgment is frequently a remunerative enterprise. If proper inducements are offered there will be no more difficulty in getting first-class men for the planing mill than there is in securing them for the machine shop.

EXPANDING NOZZLES.

When most railroad men are spoken to about a variable exhaust nozzle they instantly display feeling that ranges from mild disgust to violent resentment. Most of them are ready to declare that variable exhaust nozzles are in line with loose wheels, roller bearings, feed-water heaters, improved valve motions, and other fallacies that are constantly cropping up to annoy and disgust the men who know that these things must necessarily be failures. Yet an exhaust nozzle that could be regulated in size to meet the varying requirements of draught is one of the most desirable improvements that could be applied to a locomotive. There are greater possibilities of fuel saving in an expanding nozzle that could be easily worked, an arrangement that would be durable and not liable to get out of order, than in any single other improvements that has been tried on locomotives. It is true that hundreds of patented expanding nozzles have been applied to locomotives, and it is also true that most of them have gravitated in due season to the scrap heap. This makes nearly all railroad men ready to condemn variable exhaust nozzles on general principles, but it is another case where the species of condemnation is unsafe and unwise. Many mechanical devices have been repeatedly abandoned because a minor element required for success was wanting, and the providing of that element eventually brought about the desired result.

Those who have seen expanding nozzles used to relieve the exhaust when a locomotive was pulling out of a station, are forced to acknowledge that the saving of coal secured was highly important, but the ultimate and supreme difficulty encumbered was in keeping the steam opening from becoming distorted and to maintain the movable part in working order. The zeal for fuel saving soon wanes, and the difficulties of keeping the mechanism exposed to the action of the hot gases and cinders in the smokebox increase and become magnified by indifference to the advantage to be derived from the invention, and it is quietly permitted to fall into innocuous desuetude. That is a summary of the history of nearly all expanding nozzles. It is not creditable to those whose duty it is to see that the intensity of the exhaust of a locomotive may be regulated to suit the requirements of service. The railroad companies of the United States are notorious for the varying character of the fuel supplied to locomotives, yet the engines have the draught making appliance fixed. The result is that the nozzle must be made small enough to burn the worst of fuel, and good fuel is constantly wasted by excess of draught.

On another page we illustrate a form of expanding nozzle invented by Mr. F. Mertsheimer, assistant superintendent of the Union Pacific, which appears to have features which are likely to make it a success on the lines when other inventions for this purpose have failed. It makes a serrated opening to the nozzle, but we are not aware that this is a serious disadvantage. The specially valuable thing about the invention is the exceedingly simple means employed for changing the size of the nozzle opening. There ought to be no difficulty in keeping the mechanism of this nozzle in good working order. We have every reason to believe that a nozzle of this character would well repay any railroad company to see that it is kept in good order, and it would be well to expend some effort in training the enginemen to use it.

DISPUTES IN CAR INTERCHANGE.

The system of joint inspection of cars recommended by a committee of the Master Car Builders' Association at last convention is not meeting with the favorable reception that was expected. During a somewhat protracted journey lately through several of the Middle and Western States we talked to various master car builders and superintendents of machinery about the joint inspection system, and the sentiments expressed were almost unanimously against joint inspection in any form. They say that joint inspection is advocated by the representatives of a few large roads for the purpose of taking advantage of their weaker connections, and that wherever joint inspection is in operation the small road is unjustly dealt with. There are bitter complaints that the heads of the car department of many roads do not pretend to adhere to the rules of interchange of cars unless the rules enable them to take advantage of others; and

that the joint inspectors are dominated to ignore the rules in making their decisions. A case was mentioned where a Western railroad company repaired a foreign car that was wrecked and put in a set of wrong oil boxes. The inspector of the receiving road at Denver requested that the car should be carded, but the joint inspector decided that it needed no card, and the railroad company that hauled the car to Chicago had to give a card before the owner would accept the car. Another case was mentioned where a car had a broken draft timber, and the inspector of the receiving road wanted it put out; but the joint inspector decided that the car was safe to run, and it caused a serious wreck before it went 50 miles.

The cases that have come before the arbitration committee for decision plainly indicate that some of the men who are prominent in the discussions on the interchange rules pay very little attention during the rest of the year to the letter or to the spirit of the rules. If there is any possibility of securing advantage over connecting lines under the rules they are readily appealed to; but when the advantage is on the other side the rules are defied. There is serious heart-burning at some interchange points about the demanding of cards for old defects. Some of the roads that are ready enough to demand cards from others for old defects absolutely refuse to give such cards when they offer to connecting roads cars having old defects. Those who feel themselves unjustly treated by this selfish policy rationally insist that there can justly be no dividing line drawn between old and new defects. If a car has a defect for which it may be refused under the Master Car Builders' rules of interchange, the delivering road is entitled to card it, no matter when the defect developed. If it is old, the road had no excuse for taking it from its connection, and the fact of its being old was clear evidence of careless inspection. A road which employs inspectors who fail to find defects for which a card may be required have a just right to repair the car or bear the expense of doing so. The decisions of the Arbitration Committee have repeatedly emphasized the fact that the rules of interchange do not distinguish between old and new defects, and those that are constantly quibbling over the distinction are merely trying to beat their connecting lines.

THE CAUSE OF THE SCARCITY OF CARS.

The crops from an unusually generous harvest have begun to move toward the seaboard, and the annual complaint of the scarcity of cars has begun to sound. If appearances are not deceitful the complaints will be more general and emphatic than they have ever been before. When a car is dragged along at an average speed of thirty miles a day it is not surprising that there should be scarcity in finding empty ones to load. The slow average speed made by cars toward the unloading point is not due to slow movement between stations, but to the tedious delays in yards, and at meeting or passing points. If the responsible railroad officers would exert themselves energetically to work out the problem of moving freight cars more rapidly, we do not see that the difficulties are unsurmountable. When a car is started from Chicago to go to New York or any other point the transportation officers of the lines traversed ought to consider it their duty to push it through as expeditiously as possible. But there is no sentiment of this kind prevailing toward ordinary freight cars. Trains of stock or of perishable goods are pushed through without avoidable delays, and when these can be moved rapidly there is no reason why other kinds of freight should move so slowly. Bad systems in dealing with the movement of cars are to a great extent responsible for the tedious delays. Railroads are broken up into divisions which form the length of trip made by locomotives and crews. and there is a sentiment that it is not wrong for a train of cars to wait over in each division yard. A reform badly needed is the cultivation of the sentiment that through freight cars have no more right to be stopped in division yards than through passenger cars have to be delayed at the stations where crews change.

The movement of live-stock and perishable goods has for the last few years been giving transportation men training in the pushing of trains through without protracted stoppages, and the lessons ought to be easily applied to other kinds of freight. When hundreds of cars of grain are leaving a given point daily to be hauled hundreds of miles, there ought to be no difficulty in making up trains composed entirely of through cars, and of having engines and crews ready to take them away immediately on their arrival at division points just as in the case of live-stock. The obstacle to this appears to be in the way divisions are managed. A superintendent has charge of a division and he is responsible for the movement of trains thereon. He too often feels no general or broad interest in the company's affairs, and all he cares for is to get the cars safely over his division. If he can crowd a number of freight trains in close succession into the division yards and block the place so that the superintendent of the next division has difficulty in getting the trains out, he considers that a smart piece of railroading. This is no picture conjured by the imagination, but is a statement of what is daily going on on more than one trunk system. That practices of this character should exist indicates the worst kind of mismanagement, but there is no doubt that they are common. Competent management would insist on there being coöperation between the delivering and the receiving officers, and that it should result in the trains being kept moving. If this were attended to generally there would be less complaint of scarcity of cars, because the cars would be returned promptly to the owners.

THE MASTER MECHANICS' SCHOLARSHIPS.

In another column we publish the circular issued by the Secretary of the Railway Master Mechanics' Association giving particulars of how to enter for the scholarships established in the Stevens Institute, and outlines of the examination which candidates will be required to pass. The whole four scholarships have been secured for the opening year; but it is doubtful if candidates will be obtained for all the advanced years, as only those who have been attending an engineering school would be able to enter on the advanced studies. We understand that one or more students who are eligible for these scholarships have attended the school part of the course, and it is likely they will finish under the privileges secured by the scholarships. The entering examination is harder than what was anticipated, and that may make the candidates few this year; but we expect that in future the sons of many master mechanics will be ready to compete for the scholarships. The publishing of particulars of the examination will be a guide respecting the studies to be pursued, and a little hard work intelligently devoted to the subjects will enable most young men who have received a good common school education to enter the competition with prospects of being successful. The establishing of these scholarships is likely to do good indirectly by directing attention to this means of receiving a good engineering education. Only one scholar a year is provided for by the master mechanics' fund, but the information spread throughout the country by the notices respecting the scholarships will send hundreds who are not beneficiaries of the fund to technical schools. The men who carried through the plan of establishing scholarships with the Boston Fund have every reason to be proud of their achievement, and their good work is certain to become more apparent as years roll by. It is probable that they "builded better than they knew."

HOW TO TEST COMPOUND LOCOMOTIVES.

Many railroad mechanical officers continue to be as skeptical about the economical value of compound locomotives as marine and stationary engineers were for years about the merits of ordinary compound engines, but there are good prospects of the exact truth being demonstrated soon. Quite a number of railroad companies have ordered compound locomotives to ascertain for themselves the real value of these engines and others are keeping an intelligent lookout for information from the experience of those making the practical tests. While this interest is so absorbing it would be very desirable if the committee of the Railway Master Mechanics' Association having the investigation of compound locomotives in charge could institute a system of tests that would be as thorough and conclusive as the brake test made for the Master Car Builders' Association at Burlington. A proper test would be for the makers of the various types of compound locomotives to enter each an engine for competition and have them all work on the same road with the same weight of trains in competition with a good simple engine of the same capacity as the compounds. We do not think there would be any difficulty in getting a railroad company to provide the necessary facilities in the way of tracks and trains, and the locomotive builders interested ought to defray the unavoidable expenses connected with the tests. A plan of this kind would put all makers of compound locomotives on an equal footing, and the report of the committee would be of the greatest value to the whole railroad world.

The committee is a very able one, being composed of men accustomed to making tests of locomotives, but also of men who are eminently fair, with no known prejudices in favor of any type or make of compound locomotive. We know that President Mackenzie devoted careful attention to the selecting of members for this committee, and it would be difficult to see how the personnel could be improved. All that now appears to be necessary for securing an exceptionably valuable report is to provide the committee with proper means of investigating the subject.

RAILROAD BUSINESS OF LAST YEAR.

We have received Poor's Manual of Railroads for 1891, and find in the great volume the usual amount of valuable information regarding the railroads on the North American continent. The work covers all the transactions in relation to railroads for the year 1890. That year was not noteworthy for the prosperity of railroads, but the returns to those having investments in this kind of property were slightly better than they were the year before, and the volume of freight and passengers moved was considerably greater than it had ever been before. The net earnings are reported to have been 3.4 per cent. on the capital invested. This is not considered a rich return on investment, but those who received it, perhaps, received some satisfaction from the reflection that it might have been much better, without oppressing those who pay the transportation bills, if the railroad companies could have agreed to charge living rates for the business done. The passenger miles for the year was 12,522 millions as against 11,965 millions for the previous and 10,570 millions for 1887, when the boom of business was supposed to have been at the top wave of prosperity. The ton miles for freight hauled was 79,193 millions, as against 68,677 millions the preceding year. This did not appear like a season of depression, yet many railroad companies struggled with each other for the honor of hauling the freight below cost.

To perform the work indicated by the foregoing figures there were 32,241 locomotives owned by the various railroad companies, 30,211 passenger train cars, and 1,061,970 freight cars. If we reckon that every car carried 10 tons and that there were an average of 15 loaded cars in a train, we might strike a basis for the work done by all the freight locomotives in the country. If 50 per cent. of the total number of engines were hauling freight, it would represent an annual mileage of about 33,000 miles for each engine.

TO SETTLE ON PLACE FOR THE NEXT MECHANICAL CONVENTION.

The joint committee of Master Car Builders' and Master Mechanics' associations will meet at Buffalo on Sept. 7 to settle on the place for holding the next convention. Energetic efforts have been made to induce the committee to decide in favor of Saratoga, and the probability is that the convention will be held there. That place is convenient to reach, and is provided with good hotel accommodation, and the members have been fairly satisfied with the treatment they have received there during previous Master Car Builders' conventions. The preference of the car builders is decidedly in favor of Saratoga, but we think that the master mechanics incline toward Montreal. The latter city would be a good place to meet in, and to hold the convention there would be a graceful compliment to the Canadian members. Montreal is a very interesting city, and to hold the convention there once would give many railroad men and their families the opportunity of visiting a region they have never seen. The hotel-keepers in Montreal are ready to treat the convention to the usual rates, and there are a good many arguments in favor of going there. The city would be convenient to the New England members, and there would be a certainty of a good attendance. We feel certain that the committee would not make a mistake by voting to go to Montreal.

A correspondent who is in a particularly favorable position for seeing the danger that results from inefficient brakes, directs attention to the inefficient condition of hand brakes on many heavy cars. The practice of specifying the application of brakes to both trucks is now almost general when new cars are ordered, but we still occasionally find that the brakes are only put on one truck, even on cars that may be expected to be equipned with air in the near future. This is short-sighted policy of the worst kind, but that is a policy which flourishes like the traditional green bay tree on some roads. Those responsible for the dangerous practice of putting on one brake where two are necessary to control the car are not open to the conviction that they are wantonly endangering the lives of people on the trains where such cars are run. They do not care for any interests but those that affect their miserable selves, and if they seem to save $10 on the first cost of a car, no matter at what potential danger, they whimper for credit as economical managers. The only way to reach the sense of responsibility of this kind of vermin is to get charges of culpable recklessness brought against them in the courts when their penurious practices cause accidents.

Information has been received by the Westinghouse Air Brake Company that the officials in charge of the German railways have decided to adopt the Westinghouse quick-acting brake in place of the Carpenter brake that has hitherto been in use. This is a great triumph for the Westinghouse interests, for the Carpenter brake has not only had a monopoly in Germany, but the inventor came here and made a vigorous attempt to outrival the Westinghouse brake in the Burlington tests. The Carpenter air brake, with electric attachments for putting the quick-acting mechanism into action made some admirable stops during the Burlington tests, and it was in high favor with not a few railroad men. The serious objection to it was that very few people had confidence in electric appliances being reliable for braking purposes. The experience with the brake in actual service appears to have convinced the men responsible for the safe operating of German railway trains that an all-air quick-acting brake was an absolute necessity.

The supplement of the NATIONAL CAR AND LOCOMOTIVE BUILDER for 1891 has been published, and contains the usual amount of valuable information for railroad men and other purchasers of rolling stock and street car equipment. It contains, as usual, a full and exceptionally accurate directory of street railway companies and their offices all over the world. The supplement was the first publication to compile this list, and the work has been very well kept up. In addition to this and other valuable information the supplement has lists of all the car builders, locomotive builders and other concerns in the United States and Canada that manufacture goods used in railroad and street car equipment.

Personal.

F. C. Cleaver, M. M. of Terre Haute & Indianapolis, is on a vacation for a few weeks visiting Eastern coast.

Mr. O. H. Reynolds has been appointed mechanical engineer of the Northern Pacific, to act under the direction of Mr. John Hickey, superintendent of motive power.

Mr. Matt Ellis, general master mechanic of the Chicago, St. Paul, Minneapolis & Omaha, is prostrated with brain trouble, and is said to be in a very precarious condition.

Mr. G. H. Griggs, who was at one time general master mechanic of the Central Railroad of New Jersey, has accepted the position of assistant superintendent of the Lee Composite Co. Works, at Newark, N. J.

Mr. Sanford Keeler, general superintendent of the Flint & Pere Marquette, has resigned. He rose on that road through the successive positions of fireman, engineer, master mechanic, assistant superintendent and superintendent.

Mr. F. H. Stark, for five years general foreman of Consolidated Rolling Stock Company's shops at East Toledo, O., has resigned to accept a position as general car foreman on Western & Lake Erie Railroad, with headquarters at Toledo, O.

Mr. Henry H. Horton, who was for several years a foreman in the shops of the East Tennessee, Virginia & Georgia at Knoxville, Tenn., has accepted a position as master mechanic of a railroad belonging to the Orange Park Lumber Company, of Atlanta, Ga.

Mr. Frederick H. Robinson, assistant engineer of the maintenance of way of the Philadelphia, Wilmington & Baltimore road, has been elected professor of civil engineering of Delaware College, Newark, Del., and chief of the engineering department, just established.

Mr. E. M. Humstone, who has been for several years division master mechanic of the New York & New England at Hartford, is appointed general master mechanic of the road, to perform the duties formerly done by the superintendent of motive power. His headquarters will be at Norwood, Mass.

Mr. Albert Griggs has resigned the position of superintendent of motive power of the New York and New England, and the office has been abolished. Mr. Griggs is open for an engagement. He was for years master mechanic of the Providence and Worcester and was celebrated in New England as a shop manager, and for his systematic methods of doing work.

Mr. John Lather Ringwalt, who for the last 16 years has been editor of the *Railway World*, died at Philadelphia last month. Mr. Ringwalt was originally a printer and reached railroad journalism by way of the daily press. As a railroad writer his forte was transportation, and he prepared a long series of articles on the "development of the transportation systems of the United States," which were published afterward in book form.

Mr. D. G. Mott, Master Mechanic of the Panama Railroad, is north enjoying a month's vacation and visiting friends in Canada, where he was raised. Mr. Mott has been in Panama for six years, and has enjoyed very good health all the time, although the region is noted for the sickly climate. Mr. Mott was brought up on the Intercolonial of Canada, and worked on the Boston & Albany and other New England roads before going to Panama.

Mr. J. W. Stokes has been appointed master mechanic and car builder of the St. Louis, Alton & Terre Haute, with headquarters at East St. Louis, in place of Mr. P. H. Murphy, resigned. Mr. Stokes was for several years division master mechanic of the Ohio & Mississippi at Pana, Ill. He is a member of the Master Mechanics' Association, and collected for that organization a few years ago a great deal of valuable information about the wear of driving wheel tires.

Sylvanus D. Bradley, who has been for the last 10 years master mechanic of the Grand Rapids & Indiana Railroad, died last month, after a long and painful illness. Mr. Bradley was born at Mansfield, O., in 1833, and learned the machinist trade in a country machine shop, beginning the work in his early manhood. In 1862 he went to work in the shops of the Pittsburgh, Fort Wayne & Chicago at Fort Wayne, and four years afterward was promoted to be foreman of the shop. This postion he held till 1881, when he was appointed master mechanic of the Grand Rapids & Indiana, which position he held to the time of his death. He was highly popular with officers and men, and a highly efficient master mechanic. He has been a member of the Master Mechanics' Association since 1883, and attended the meetings and displayed warm interest in the proceedings.

Mr. W. W. Thompson has been appointed master mechanic of the New York Central, with headquarters in New York, where he has charge of all running locomotives. Mr. Thompson has been for the last seven years road foreman of engines of the elevated railroads of New York, and Colonel Hain, the general manager, speaks of him as an extremely zealous and efficient officer. Few railroad men have had the varied experience of Mr. Thompson. When almost a boy he went to India with some machinery, and before it was set up the mutiny broke out, and as all whites required to exert themselves for self-protection, Thompson volunteered for military service and passed some months in a cavalry regiment, and was severely wounded in action. After he recovered he ran a locomotive for some time on one of the railways. Getting tired of the climate of India he returned to the United States, and worked in various capacities on several railroads. He afterward spent several years on the railroads of South America. Experience in different countries led him to the conclusion that there was no place like the United States, and he came back to stay. He was for some time division master mechanic of the Southern Pacific before going to the New York elevated railroads. There is no more genial railroad man in the country than W. W. Thompson, and the stories he has collected in his far reaching travels makes him the most amusing companion in the world.

William Wilson.

Mr. William Wilson, formerly superintendent of machinery of the Chicago & Alton, who has been suffering from nervous prostration for over a year, died in Chicago last month. Mr. Wilson was what may be termed an inventive master mechanic and he was one of the ablest of this class. He was born at Rochester, N. Y., in 1832, and learned the machinist trade in a machine shop in that town. In those days Rochester was ambitious to become a railroad center, and the leading men of the place were working up railroad consolidations. There was as early as 1850 all rail connection between the Hudson river at Albany and Lake Erie at Buffalo by the way of Rochester, but it consisted of seven distinct and independent companies. Rochester people thought that by having the lines consolidated their city would become the distributing point of western trade. It was only after their efforts at consolidation were crowned with success that they discovered its effect was to make their town a way station.

During Wilson's boyhood, what railroads were going to do for the country became a familiar article of faith. One day, shortly after his apprenticeship was finished, he was seized with an impulse to go somewhere, and happening to be at the depot when the feeling was strong upon him he stepped on board a train and next morning was in Buffalo. Only a year before Horatio G. Brooks had spent two months taking a Hinckley locomotive by rail and water from Boston to Dunkirk, and the latter village was putting on airs, as the lake terminus of the great Erie Railway had a right to do. This was now the Mecca of railroad men, and thither Wilson found his way, and at once went to work in the shops as a machinist. That was in the spring of 1851.

Here he remained for two years and then went West, his first stop being at Michigan City, Ind., where he went to work in the shops of the Michigan Central. After remaining here for a year or two he went to Illinois and went to running a locomotive. He followed this business for a year or two. One terribly stormy night he was working his way along with a freight train. At a certain station the conductor came forward and ordered him not to stop at a water tank ahead, as it was at the foot of a grade and the train was too heavy to take up without doubling if a stop were made. "You do not need water there, any how," the conductor added. To be dictated to about his work by a conductor was just the thing to make William act contrary, so he made up his mind to take water. The tank was at the bottom of two grades. When Wilson got to the top of the descending grade he left his train and went ahead to take water, intending to return and make a run for the grade past the tank. When he got to the tank he found the creek beside it a swollen torrent and the bridge gone. That was his last trip as an engineer.

After drifting about in various railroad shops for a few years he settled as general foreman of the Galena & Chicago Union shops at Chicago. When the consolidation of that road with the Chicago & Northwestern took place the Galena men were not on the winning side and Mr. Wilson quit. He shortly afterward, in 1865, was appointed master mechanic of the Galesburg division of the Chicago, Burlington & Quincy. Here he was associated with Mr. Robert Harris, who was assistant general superintendent, and recognized Mr. Wilson's conspicuous mechanical abilities. Four years afterward he was made general master mechanic. He was the first man to introduce uniformity in the machinery of the Chicago, Burlington & Quincy, and he also struggled hard to improve the system of working in the shops. The Chicago, Burlington & Quincy was infested at this time with relatives of Eastern stockholders, and those that came under Wilson's control found that they had to work like other men or get out. This raised a strong feeling against him among people of influence, and when Mr. Harris failed on re-election as president an order for Mr. Wilson's discharge very promptly followed.

He was next for a year master mechanic of the Wabash, at Fort Wayne, which he left to accept the position of superintendent of machinery of the Chicago & Alton. While in this position he worked down the interchange ability of parts for convenience in repairs in a way that it had never been done elsewhere. As a clear headed designer of machinery, as a business-like shop superintendent and as a manager of men, Mr. Wilson had few equals. He was also a fertile inventor, but his inventing was his stumbling block as the head of a railroad mechanical department. His particular hobby as an inventor was to improve on the link motion and common slide valve. He patented several devices intended to be improvements, but they all proved failures. He was better informed on valve mechanism than any man we have ever met, and where he failed all others had better not enter.

Grand Rapids & Indiana Mechanical Department.

It does not appear to be the intention of the management of the Grand Rapids & Indiana to appoint a successor to Mr. Bradley, the deceased master mechanic. Mr. Hughart, president and general manager, has issued the following order regarding the mechanical department:

Mr. James E. Keegan is appointed foreman of locomotive repairs, and will have general charge of machine, blacksmith, boiler and tin shops.

Mr. D. Z. Kline is appointed foreman of car repairs, and will have general charge of car, coach, paint and repair shops and repair and lumber yards.

All car inspectors who have heretofore received instructions from the master mechanic will report to the chief car inspector (to be appointed hereafter), who will report to and receive instructions from the foreman of car repairs.

Mr. G. S. Bucher is appointed chief clerk motive power department, and will have general charge of the office force at the shops, with authority to approve requisitions for material, certify to vouchers, and to handle correspondence connected with the motive power and car departments.

Mr. Harry Johnson, road foreman of engines, will have charge of all roundhouses and men employed in them.

The foreman of locomotive repairs, foreman of car repairs and chief clerk of motive power department will report to and receive instructions from superintendent of the Northern Division.

Another Claims to Have Invented the Chilled Car Wheel.

The construction of the Ithaca & Owego railroad was commenced in the year 1827. The company bought all their iron work except the rails of Coffin & Dennis, proprietors of a foundry and a machine shop at Ithaca, N. Y. Mr. Henry Mooers, now of Toledo, was their foreman in charge of their foundry and machine shop. When the I. & O. company ordered their car wheels it was suggested by Mr. Mooers, the foreman for Messrs. Coffin & Dennis, and Mr. Randall, the general superintendent of the railroad, that the wheels would wear better if the flange and tread were cast against a chill.

These gentlemen approved the idea, and said to Mr. Mooers, "If you think you can do it successfully go on and make them that way." The first thing to do was to make the chill mold, which was of iron, about six inches wide and three inches thick, turned out so that the inside would make the pattern for the flange and tread of the wheel. The hot melted iron poured into the mold, coming in contact with the cold iron, produced the chill on the car wheel. It was found in the first trial that the shrinkage of the iron spokes was so great that many of them would break. This defect was remedied by making the core for the hub with three wings attached, which would divide the hub in three sections, and this would allow the spokes and hub to contract in cooling and not break from the rim of the wheel. The spaces left in the hub were filled with about one-fourth inch wrought iron, and one and a half inch wrought iron bands were shrunk on each end of the hub. These were the first chilled iron wheels ever made.

All car wheels were made with spokes and divided hubs previous to 1838.

In 1837 Mr. Mooers invented the solid hub chilled car wheel, which was patented the 10th day of February, 1838. All railroads are now using solid hubs and chilled wheels as invented by Mr. Mooers, though there have been other improvements by making the wheels without spokes, etc. —*Detroit Paper.*

The Baldwin Locomotive Works, at Philadelphia, will establish a test department of their own, which will be available to railway companies desiring to have tests made of locomotives. This department will be equipped with the latest forms of apparatus and will be in charge of competent men who are continually employed in this class of work. They have been gradually working up to this step for some time past, and the introduction of compound locomotives has shown the advantage of it. Arrangements have now been made to establish this as one of the main departments of the works.

Communications.

Breaking of Stay-bolts.

Editor National Car and Locomotive Builder:

Kindly allow me a little space in your estimable journal for the following remarks:

Much has been said and written both in America and England about the breaking of stay-bolts in the fire-boxes of locomotives, and the general theory seems to be the unequal expansion of the fire-box and shell, due to the great difference of temperature of the two. But I am very much inclined to think there are sometimes other disturbing forces at work in the inside of locomotive boilers which I have never yet seen discussed in any of the leading technical journals, and which I believe have never been even thought to exist. If you will be kind enough to bear with my very crude manner of expressing myself I will try in as few words as possible to explain to what other causes I attribute the breaking of stay-bolts in locomotive fire-boxes besides unequal expansion, bending and elongation of plates and stays. I began my career on the foot-plate of locomotives in 1855, when the highest boiler pressure did not exceed 80 lbs. per square inch, and have been on the foot-plate both in and out of England many years, and have followed the increased boiler pressure up to date, and only until the last few years did I ever know anything about broken stay-bolts, or at least very little, and yet I have worked locomotives very hard, and under trying circumstances (for example, in war time). Of course, I am aware that bulging from overheated plates and the drawing of stay-bolt heads nearly through where incrustation has taken place, etc., but the breaking off of stays was a thing little known on any railway where I have been until late years. Perhaps you will say it is only in late years that holes have been bored into the stay ends so that it may be seen where they break, and it is about the handling of locomotives during these late years I wish to try and explain what I think is the cause of stay-bolts breaking otherwise than by unequal expansion. The introduction of powerful steam, air and vacuum brakes has been one of the reasons for railway companies increasing the speeds and weights of trains, and that fact is in my opinion to a very great extent the cause of the stay-bolts being broken, and it happens thus:

Engine drivers having powerful brakes at their command often rush into wayside stations at a speed no engine driver of earlier years could have found possible to do, and the powerful brake is applied to its fullest capacity to check this high speed in as short a distance as possible; and while the brake is on and the momentum of the train is retarded, the water is drawn to the front end of the boiler, and when the train is suddenly brought to a standstill the accumulated water rushes to the back end, and, the elastic force of 140 or 160 pounds of steam following, strikes the back plates with terrific force, and in nine cases of ten away goes one or more stay-bolts. This practice is happily not carried out by intelligent drivers, but we must not forget there are among engine drivers men who do not come up to the intelligent standard, and it is these men who generally have most stay-bolts broken in their fire-boxes. You may rest assured that not many gentlemen of the locomotive engineering master mechanics profession ever get a chance of seeing such handling of engines as I have just mentioned, because drivers will take very good care to manage better when superior officers are along. I have, nevertheless, satisfied myself that the practice is very common. I have tried to explain to the men whom I am connected with, and some of whom I knew abused the proper working of the brakes, the danger of such practice, and have frightened the worst of them, and lo! nearly everything in the shape of broken stays vanished at once. Where we put new stays in daily, now we have none on this section. Some time ago I was sent down our line on business, and I happened to get on to the foot-plate of a passenger engine with a driver of the above-mentioned type, and I think he wished to show his superiority to an antiquated driver, as he considered me, and on approaching a wayside station I asked him if he intended to stop there. "Oh, yes," he replied, and when within a very short distance of the station, at a very high speed, he applied the vacuum brake to its fullest capacity and stopped the train right enough at the platform, but in such a manner that he satisfied me for ever riding on the foot-plate with him any more. A few seconds before the train stopped all the water was out of the glass, and when it did stop, with a suddenness that alarmed me, the water and steam rushed against the back end of the fire-box and up out of the safety valves with a force enough to knock the back plates out, and the consequence was a broken stay-bolt on the top row where there was more steam room and where the action of the recoiling water and steam could act best toward breaking the stays.

It is well known that the conversion of the static pressure into a dynamic force by suddenly opening a large steam or safety valve may produce a violent rush of steam and water against the part of the boiler whence the steam is drawn. The percussion of the water and steam in such cases has been known to terribly shake the boiler, and also been known to lift safety valves clean off their seats.

Now, what I wish is, will you, Mr. Editor, or any of the technical correspondents to your estimable journal, be so kind as to express an opinion on the above mentioned matter? Is the static pressure converted into a dynamic force by the water being drawn forward on the application of the brakes, and on the sudden stopping of the train, its rushing back, the same as by the sudden opening of a regulator or big safety valve?

Is it or is it not possible to bring about a disastrous explosion by this percussive force acting on some possibly weakened parts? And lastly, is it not possible that the plates, and consequently the stays, are weakened more than usual by the fierce action of the fire during the momentary absence of all water at the back end of fire-box, and the plates being thus hotter and the stays in full tension, when the recoiling water and steam rushes upon the plates at the top row of stays, where there is least resistance, they will be bent shell outward and fire-box inward, then the stays will and must break.

Hoping you or any one will give an opinion through the columns of your journal, I will feel deeply obliged for the same.

G. BAILEY,
Locomotive Foreman States Railway.

DENMARK, June 25, 1891.

The Cone-Shaped Boiler.

Editor National Car and Locomotive Builder:

I respectfully invite your valued attention to a notice on page 121, August number of the NATIONAL CAR AND LOCOMOTIVE BUILDER, of an improved locomotive boiler said to be originally designed by Mr. John Mackenzie, superintendent of motive power of the New York, Chicago & St. Louis Railway Co.

The advantages claimed is the substitution of a cone sheet for several segment sheets.

What I desire to call your attention to is, I have been making this design of boiler for the last eighteen years, and have a patent on a gusset, or cone connection, made of but one single plate! A pamphlet of which I herewith inclose you. I have mailed more than 5,000 of those pamphlets. I have also made the wagon-top sheet of but one plate from its junction with the water bar on one side to the other. Also made the firebox (sides and crown but one sheet).

Will you kindly correct this in the September number of the CAR BUILDER, and so set me right? J. T. CONNELLY.

[We are very glad to publish the above letter, as it directs attention to the original designer of that form of boiler. But our correspondent is mistaken in saying that we mentioned Mr. Mackenzie as being the original designer.—ED.]

Inefficient Brakes.

Editor National Car and Locomotive Builder:

While we are waiting for the long-hoped-for time when all freight cars shall be equipped with air brakes, it might be well to give a little attention to those hand brakes that are still necessary.

It is notorious that a vast number of cars of 20 tons capacity and upward are moving over the country with single connected brakes, operating on one truck only, and even then often in bad condition. Considering the necessary speed of freight trains and the tendency to accelerate it, to accommodate increasing traffic, those cars are not fit to be hauled with safety on comparatively level roads, yet are sent over roads with heavy grades.

It is very unsatisfactory for a crew of, say, three brakemen and a conductor to attempt holding a train on a grade of 2 or 2½ per cent when three-fourths of cars composing train have single brakes on one truck only, the others, one-fourth, having double-acting brakes; yet 50 per cent. of the entire equipment in middling or poor order. This statement is not a supposition; practice that accords very closely to the foregoing description can be found in several parts of the country at present. Heavy sleeping cars with almost no brakes on them make available rams to help increase the damage at the front end of train very often in wrecks. It seems that some conscientious method of joint maintenance of air and hand brakes is needed; but while each road or division of a system strives to get out of doing all work possible, particularly that necessary toward keeping brakes in a high state of efficiency, little is to be hoped for in this direction. It is about time, however, that the practice of building cars without brakes on all wheels was discontinued. J. J. CLAIR.

They Do Not Use Valve Lubricators.

My business of drumming takes me to a great many railroad shops, and it is my practice to gently entice the man in charge out to the roundhouse that we may have the excuse for swapping stories about what happened in the flowery mystic past, for I love to hear about the days when a 14 × 22 engine would surpass the performance of the big engines that are growing so common nowadays. Years of experience from fireman to master mechanic gave me the means of picking up a few incidents of railroad life that can be retailed to bring forth others.

While calling on my old friend Primus a few weeks ago I found him saturated with vanity about a new ten-wheel freight engine that had been at work for a month or two, and said to be of the Primus design. We strolled together to the engine-house, and found a really handsome engine, which seemed to merit all the praise we were ready and willing to lavish upon her.

The engineer was there, and on hearing my complimentary remarks about the engine concluded at once that I knew what I was taking about, and he freely pursued the subject of his own volition.

After expatiating at some length on the fine points of the engine he remarked: "But there is one thing about her that is funny. She will sometimes go lame near the top of summit grade, and there is not a thing the matter with her. Not a bolt or nut loose. She will be lame there, and nowhere else. It is just as she crosses over Rabbit Creek bridge that you may expect her to step onto three legs, and then she is as likely as not to lay down with the train."

As he finished there was a strained note in the man's voice, his eyes had a far off look in them, and he acted as if he believed that some occult force rose from Rabbit Creek and temporarily injured the engine.

There was an incredulous smile on the visage of Primus, and he mutely remarked: Did you ever see such cranks as some engineers are, anyhow?

In answer to the very eloquent look, I said: "She has long, bent eccentric rods, large unbalanced valves, no automatic valve lubricators, and summit grade is a long, hard pull."

"But what has that to do with the engine getting lame?" questioned the master mechanic.

"Mere cause and effect, that is all. When the valves get dry they are hard to move and spring the long eccentric rods."

"I must have the rods made heavier in the other engines that are coming," was the decision Primus at once jumped at.

"How would balancing the valves and putting on sight feed cups do?"

"Balancing valves and lubricators!" exclaimed my friend, with a frightened look on his face. "Why, the general superintendent would call me crazy if I asked for those expensive additions to the engines."

I perceived at once the force of the objection and how strongly it came home to the man responsible for the expense of operating the engines.

Business took me to the general superintendent later in the day, and there was no difficulty in getting him to talk about the new freight engine. I also spoke of the need for lubricators and balanced valves, and the saving in fuel, oil and expense of repairs that would result.

"Saving!" he cried, with wrathful energy, "it is wasting you mean. There is nothing thought of among you fellows but how to spend money. I have run this railroad 30 years without lubricators or valves and I am not going to give in to them now. The next thing they will be asking for airbrakes on the engines."

I have no reason to believe that the lubricators or balanced valves were ordered. SAM SHORT.

What has been spoken of with some degree of truth as an extraordinarily heavy train was recently taken over the Philadelphia & Reading. The train was made up of 90 long "hopper" cars carrying an average of about 25 tons of coal each, or 2,375 tons in all. Each hopper car is 34 ft. 1 in. long, and including engine and caboose car in the rear of the train, the whole train was 3,100 ft. long. The ordinary train is made up of 40 to 45 of these hopper cars. The engine hauling this train weighed over 75 tons, loaded. This long train was an experiment, and was entirely successful. It should be noted that the Reading line has a continuous down grade from the coal regions to tidewater, or "with the trade." On the return trip the same engine described above hauled back 240 of the old four-wheel empty coal cars, equivalent to 60 of the empty hopper cars.

A special form of exhibition railroad car has been patented by Samuel J. Rosenfeld, New York. The novelties consist in the arrangement of racks.

The spark arrester that provides the means of conveying the sparks back to the firebox, has lately been protected by a new patent, William Burt, Portsmouth, O., paying the tax. This one proposes to stop the sparks by means of a diamond and netting in the stack, drop them into a pipe set vertically inside the stack, and from thence convey them back to the firebox in a pipe set on descending grade. A pipe is also provided for conveying hot air from the smokebox to the firebox.

At the armor-plate mill of Carnegie, Phipps & Co., at Homestead, an armor ingot has been cast 80 inches wide and 23 inches thick, weighing 32,000 pounds. It is the largest armor plate ingot rolled in this country. The ingot was cast in a sand mold for a test, and the material proved much superior to that tested in a metal mold. Heretofore there has been a great deal of trouble in casting in metal molds, owing to the many flaws. An ingot cast in the sand mold was found not to contain a single flaw. It is more than likely that hereafter sand molds for turning out armor plate ingots will be adopted. Tim McKay is the inventor of the new process. He is working at the Homestead mill.

Duplex Compound Locomotive, St. Gothard Railway.

The accompanying cut, for which we are indebted to the *Engineering News*, gives a good idea of the large compound locomotive of the Mallet type, recently built by Herr Maffel for freight service on the heavy mountain grades of the St. Gothard Ry. The builder was required to produce a locomotive which, with the same boiler pressure, 177 lbs., and the same weight as the regular eight-coupled engine and tender of that line, would give the same efficiency with less fuel consumption. At the same time it was desired to have the new engine run more smoothly than the old form.

The eight-coupled locomotive had a rigid wheel base of 12.8 feet, while the compound has a rigid base of only 8.85 feet, and can consequently follow the many curves of the Gothard line with less sliding and less danger of derailment. The compound system is easily carried out in this case, as on other mallet compound engines of similar design. The rear (high pressure) cylinders are rigidly connected to the main frame, which carries the three rear axles, while the front pair, which are for low pressure, are so attached to the movable forward truck that the steam connections are easily made, especially since they work with the low pressure of 59 lbs. With this pressure there is little difficulty in connecting the two pair of cylinders and still less in connecting the exhaust pipe with the blast nozzles.

By adopting the tank form of engine a greater adhesion is of course produced than would otherwise be the case; and as a starting valve is provided, so that the high pressure exhaust can be directed into the air or low pressure cylinders at will, while live steam can be admitted into the latter, it is possible to start easily with the maximum train load on the steepest grade; that is, 220 tons exclusive of the locomotive, on a grade of 2.67 per cent.

The symmetrical distribution of weight and steam on both sides of the locomotive insures an easy riding machine. The boiler is rigidly attached to the main frames at the rear, and rests on the forward truck on two cast-iron slides moving in oil, which are carried on rocking supports firmly attached to the frame of the truck. In order to insure a quick return to the proper position in passing from curves to tangents, a set of springs is placed in a horizontal plane, while the inequalities of the track are overcome by a series of longitudinal and transverse equalizing levers. The engine is fitted with the Exter emergency brake and the Hardy vacuum brake working on eight wheels, having one shoe on the outer side of the two outer wheels of each group.

An interesting comparison of the different sizes of three existing Mallet compound locomotives is given in the following table. The engine of the Swiss Central Railway was built by Herr Maffel and has eight wheels, while the *Tom Pouce* is one of the little engines, also with eight wheels, which attracted so much attention on the Decauville line, of 24 inches gauge, at the Paris Exposition of 1889:

DIMENSIONS OF THREE COMPOUND LOCOMOTIVES; MALLET SYSTEM.

	Tom Pouce.	S. C. Ry.	St. G. Ry.
Cylinders, diam, H. P....	0.61 ft.	1.16 ft.	1.31 ft.
" " L. P.	0.92 "	1.80 "	1.90 "
" stroke.....	0.85 "	2.10 "	2.40 "
Wheels, diam.....	1.97 "	4.19 "	4.03 "
Wheel base, each group...	2.80 "	.....	8.85 "
" total.....	9.20 "	21.30 "	26.70 "
Length over buffers.....	17.70 "	35.50 "	45.20 "
Boiler pressure	177 lbs.	177 lbs.	177 lbs.
Heating surface, fire box.	25 sq. ft.	87 sq. ft.	100 sq. ft.
" " tubes.	215 "	1,164 "	1,564 "
" " total....	240 "	1,251 "	1,664 "
Grate area.....	5.3 "	19.6 "	23 7 "
Water	2,980 lbs.	11,000 lbs.	15,400 lbs.
Coal.....	1,100 "	4,400 "	9,500 "
Weight, empty.....	20,500 "	106,000 "	151,000 "
" loaded, max	25,600 "	131,200 "	190,000 "
Tractive power	3,970 "	.....	21,400 "

A great part of the bar iron used has been for years made from the reworking of old iron rails, but it is now reported that old iron rails are becoming so scarce that in the future all bar iron will be made from scrap and puddled pig iron.

Passenger-Car Body Color.

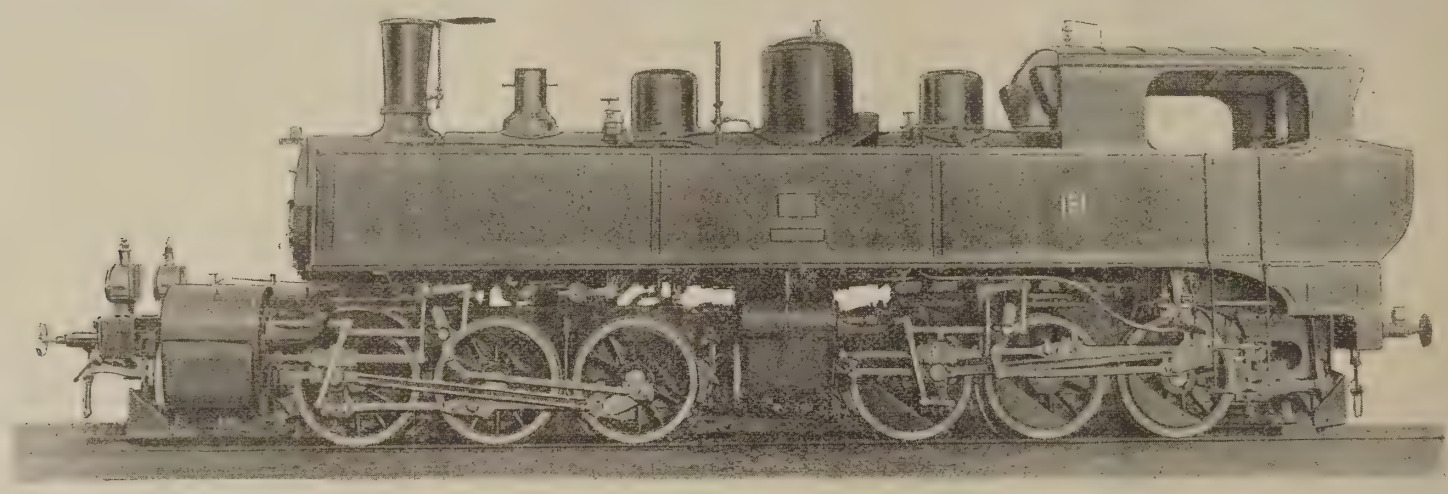
What is the color for the bodies of passenger equipment? The great controversy for years has been between light and dark colors. The primitive color for coaches and cars was light—usually some formula of cream or straw color; and many railroads, with good reason, cling to it yet. I say with good reason, because durability and economy appear to be on that side of the question; from the fact that such a color is composed largely of lead, which is to painting what a rock bottom is to a house. It forms a lasting basis for the decoration and lettering and the finishing coats of varnish which, though the car is run beyond the endurance of the varnish, yet when cleaned it stands the operation to such an extent that though you rub through the varnish and touch the color it is not ruined, for the succeeding coats of varnish restore it to its former condition. Not so with the dark body colors which contain no lead, but are only a thin stain over the surfacing coats. If you rub through your perished varnish and touch this color it is gone and will have to be retouched and in nine cases out of ten painted all over; because with a dark color the temptation is increased among railroad managers to run the car longer, as the dirt does not show on it. Light-colored cars get to the shop soonest, because the dirt shows so on them that they cannot be borne any longer; but in reality they will run longer than the dark ones without damage to the paint.

The principal argument for a dark color is on the line of uniformity in appearance in the train, when cars of all ages of paint and revarnishing are mixed together. The railroad men hate to see black cars and white ones chasing each other in the same train as bad as a farmer does a flock of sheep of like character. This is a day of uniforming the train men, and the cars are desired to be likewise uniform in appearance. It gives evidence of wealth and centralization of power. Of course a newly varnished car is not going to look like a dirty one which has been out of the shop a year or two, but the contrast is less with a dark color than with a light one. A man with a pair of black boots will not attract so much attention on the street with one of them polished and the other dirty as he would with a yellow one and a black one on. Large railroads with cramped shop room are obliged to let their cars run longer than small ones with plenty of shop space; and so the dirtier the cars will get, and hence the more imperative necessity of a dark color on a big system than upon some small line.

There is one argument in favor of durability in a dark color, however, which is seldom mentioned, namely, the thinness of the body of pigment upon the car. To explain: If you paint a car light straw-color four or five color coats composed of lead will be needed, which will aggregate some 50 or 75 pounds of pigment, making quite a thick coating upon the car, to be subject to cracking and the sucking up of varnish. If you paint a dark color two or three coats of a light pigment will only be required, making in all only about 25 pounds, or a very thin layer of paint upon the car, which, if mixed properly, holds the varnish out to endurance much longer. Cracking ought to be for this reason deferred longer.

But on the other hand, we have in a dark color the greatest attraction for the sun, which is the great destroyer of the life of varnish, and therefore the hastener of the end when the best days of a good job of work are past, to say nothing of the increased heat to passengers in the hot months of the year. So there are arguments pro and con of this subject, and railroad managers should look at them all squarely in the face and weigh them carefully before they decide to change. It will be found also that a varnish dries much slower on a dark color than on a light one. Light is an essential quality in the drying of varnish, and the luminous ground of a light color exerts a powerful effect in the drying of the varnish, and the darkness of a dark color likewise in the opposite way. And many deviltries of varnish will occur right here, if one is not on the lookout for them. A quicker drying and hence less durable varnish will have to be used.

But, perhaps, taking all things into consideration, there may be sufficient reason to prefer a dark color; if so, what color shall we select? Well, first we say, one made of as few and as chemically affinitized and enduring pigments as possible. The writer's preference lies in the use of some shade made by the union of three pigments only, namely, ivory black, golden ochre and Tuscan red. If one prefers a greenish tint, he has only to lessen the red; if a brownish cast, lessen the yellow and increase the red. Perhaps the "Pullman color" of the shade now used, which is composed of these colors, is about the best color, all things considered, that can be used. At least we prefer it to anything yet seen. Some of the mongrel shades made of a half-dozen evanescent colors to suit the capricious, dreamland fancy of some railroad magnate who knows as little of the laws of chemical union of pigments or of their nature as a Choctaw Indian does of grammar should be avoided by a wide margin. At least a color should be chosen which you can "touch up" in five minutes after painting without a serious interruption in the chemical changes which are rapidly going on. This is a most important subject for railroads, and all interested to consider and should not be hastily and flippantly decided; but summoning all the wisdom of experienced minds, we should carefully weigh it before casting our ballot for a color for a thousand cars, whether light or dark. And it might be well to consider the effect that dark-colored cars will have in already poorly lighted shops; whether men can see to do the work of properly cleaning and varnishing them in between two trains where a shop has two or more tracks running clear through it, without burning gas all day to much expense to the company and a greater expense to the eyesight of the men.—*Charles E. Copp, in Painters Magazine.*



DUPLEX COMPOUND LOCOMOTIVE, ST. GOTHARD RAILWAY.

The Largest Plank in the World.

The *N. W. Lumberman* gives an engraving from a photograph of a redwood plank that is 16 feet 5 inches wide, 12 feet 9 inches long, and 5 inches thick, and is about 20 per cent. clear. It was taken from a tree 35 feet in diameter and 300 feet high. According to its rings it was more than 1,500 years old. The tree was cut 28 feet from the ground, and the plank was hewed out of the stump, representing a section taken from near the heart to the bark. After it was displaced it was lowered by block and tackle, with a locomotive for power. In the way of labor its cost represents the time of two men for a month simply to prepare it in the rough for shipment. To this the cost of transportation must be added, making a total of about $3,000. It was moved by water to San Francisco.

After being on exhibition some time, a car was specially prepared to transport it to Chicago. This was done by cutting a slot in the center of a flat car, in which stirrups were pendent. The plank was placed on edge in the slot, its lower edge being within about a foot of the ties.

The plank was cut on the lands of the Elk River Mill and Lumber Company, in Humboldt County, Cal., is the property of J. L. Harpster, of Eureka, and B. F. Noyes, of San Francisco, and is on exhibition in Detroit, Mich., whence it may be sent to East Saginaw and elsewhere, to finally bring up in Chicago at the World's Fair. The plank shows coarseness of growth, with richness of figure, and a finish such as the highest quality of material and the best efforts of Berry Brothers, the varnish manufacturers, of Detroit, can secure.

Locomotive Journal Bearings.

After experimenting extensively to find a satisfactory metal for locomotive journal bearings, the Chicago, Milwaukee & St. Paul mechanical department have settled upon the following specifications:

Main Bearings.—Copper, 84 per cent.; tin, 14 per cent.; antimony, 1 per cent.; lead, 1 per cent.

Rod "Brasses."—Copper, 84 per cent.; tin, 15 per cent.; lead, 1 per cent.

Truck Bearings.—Shell to have same composition as main bearings, the weight being carried on Babbitt strips.

To make this "Babbitt metal," melt one part of copper in a crucible ond add one part of tin. Reduce the heat to a dull red, and add two parts more of tin and two parts of antimony. Stir until antimony is melted and have surface of metal covered with powdered charcoal. When the above alloy is melted, add three parts more of tin. Stir well and cast for use as required. This is called "hardening," and contains one part copper, two parts antimony and six parts tin.

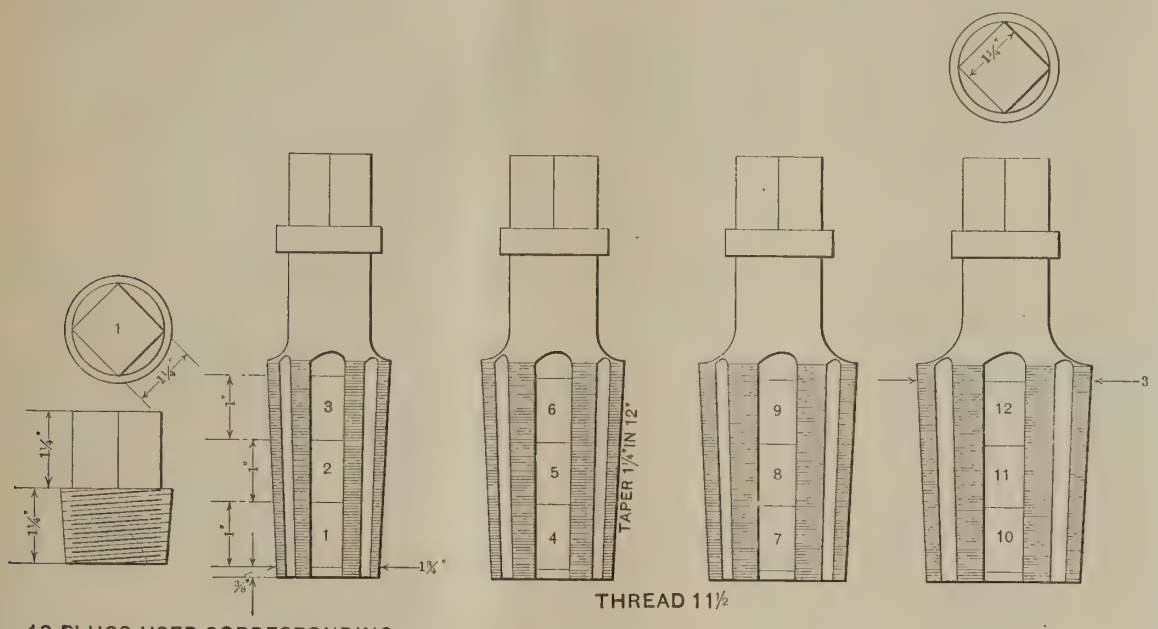
For the final mixture, melt one part of "hardening" with two parts of tin; the resulting composition forms the standard "Babbitt" alloy, as follows:

Copper, 3.7 per cent.; antimony, 7.4 per cent.; tin, 88.9 per cent.

The metal used must in every case be new and of the following brands: "Lake Superior" copper, "Banca" or "Straits" tin and "Cookson" antimony.

Mud Plugs.

When I had charge of the light tool work one of the most annoying things to me was the mud plug business, and how many shops are there at the present time doing this work the same old way. The foreman in charge of the erecting-room will say to some man, get a taper tap about two inches at the small end, and find a wrench, if you can, to fit the tap, inside of a half hour. Then tap out the hole and make a chalk mark on the tap next to the boiler. so the machinist can get the size. Take the tap to the foreman of the latheroom and tell him to hurry out a plug. If the tap has five flutes in it to calliper from, the boys usually say, this is fun, if they don't swear. Then rig up a lathe, get the right taper, turn and cut the plug to the chalk mark. This is a hurried job and the setting up man waiting for the plug.



MUD PLUGS.

Now if it be worth your notice I will send you a sketch (illustrated in annexed cuts) of taps and mud plugs and how we use them. Each tap is marked off with lines on them one inch apart and numbered from one to twelve. Each plug is numbered on the end from one to twelve to correspond in size with the number on the tap. The square, on the taps and plugs are of the same size, so that one wrench will fit tap or plug. A man can get from the tool-room a tap and wrench, tap out a hole up to number four or six on the tap, as the case may be, and then draw from the storeroom the number of plug he wants. A quantity of each number is kept in stock all finished. When we make a new hole in a boiler, we start with a number five plug.

E. E. D.

Master Mechanics' Association Scholarships.

Secretary Sinclair has issued the following circular to the members of the American Railway Master Mechanics' Association:

The scholarships which this association has secured in the Stevens Institute of Technology, Hoboken, N. J., will begin this year, and candidates are required to be in attendance for examination on the week beginning Sept. 23. Candidates must be the sons of members or of honorary members of this association in good standing, or the sons of deceased members who died in good standing. They must also have worked for at least one year in a recognized machine shop, and they are required to take the course of mechanical engineering. The rules of the school require applicants for admission to be over 17 years of age.

Candidates for the scholarships should apply to the secretary of this association, and he will supply them with certificates if they are found eligible.

There are four scholarships open this year, one for four years', one for three years', one for two years' and one for one year's course. The candidates for the four years' course will be required to pass the Freshman examination; those for the shorter terms will be required to pass the examination of the scholars belonging to the respective years.

EXAMINATIONS.

Candidates for admission to the Freshman class will be examined in the Stevens Institute on the following subjects:

Arithmetic.—The preparation should be especially thorough upon the properties ot numbers, the operations in common and decimal fractions; the methods of finding the greatest common divisor, and the extraction of the roots of numbers.

Algebra.—Simple equations, theory of radicals, equations of the second degree, arithmetrical, geometrical progression, permutations, by binomial theorem, indeterminate, co-efficients, logarithms, and series. Great importance is attached to a thorough knowledge and readiness in the solution of simultaneous equations of the second degree, and the reduction of radicals.

Geometry.—All plane, solid and spherical geometry. The examination in this subject will be thorough, and the applicant must show a familiarity with all the fundamental geometrical forms, and be able to demonstrate their properties and relations. He should also be able to point out the most important ones.

Analytical and Plane Trigonometry.—The fundamental formulæ and their demonstrations, as well as the solution of plane triangles by means of natural and logarithmic tables, will be insisted upon.

English Grammar.—The requirements are a practical acquaintance with the parts of speech, their relations, agreements and government, the proper use of tenses and moods, the construction and arrangement of sentences.

Composition.—An essay upon some topic assigned at the time of examination, and examined with reference to legible handwriting, correct spelling, punctuation, and proper expression.

Universal History.—In the examination in Universal History but little prominence is given to dates. The questions relate to the great events, their causes and effects. A conspicuous place is given in the questions to the history of the United States. Text books—Myers' or Barnes' General History and United States History, or Johnston's, or Higginson's, or Eggleston's United States History, or Montgomery's American History.

Rhetoric.—The examination in Rhetoric will embrace all parts of the subjects which are contained in the text-books on Rhetoric. Text-book—Hart's Rhetoric.

French.—The examination will be on translation from Knapp's Modern French Readings, the first half of the book, or from some equivalent, such as Super's French Reader or Fontaine's Historiettes Modernes.

Physics.—As much of Physics as is contained in Part I. of Deschanel's Natural Philosophy. (D. Appleton & Co., New York, publishers.)

If there is more than one candidate for each scholarship, the applicant who passes the highest examination will be chosen. This will be settled by the school authorities.

Committees of the Railway Master Mechanics Association.

The following are the subjects of investigation of committees of the American Railway Master Mechanics' Association, and the committees appointed by President Mackenzie to carry on the work:

1. *Exhaust Pipes, Nozzles and Steam Passages.*—C. F. Thomas, A. W. Gibbs, L. S. Randolph, J. M. Wallis, Geo. W. Smith, Robert Quayle, John Y. Smith.

2. *The Present Status of the Car Coupler Question.*—John Hickey, G. W. Rhodes, Sanford Keeler, R. H. Blackall, M. N. Forney.

3. *Standard Tests for Locomotives.*—To investigate the practicability of establishing a standard system of tests to demonstrate the fuel and water consumption of locomotives. Also to ascertain the value of the steam engine indicator in locomotive tests. J. N. Lauder, J. Davis Barnett, Albert Griggs, John D. Campbell, F. W. Dean.

4. *Compound Locomotives.*—To investigate the relative economy of compound and simple locomotives, also the most valuable form of compound locomotive. George Gibbs, William H. Lewis, Pulaski Leeds, James Meehan, T. W. Gentry, A. T. Woods. Auxiliary Committee.—S. M. Vauclain, Baldwin Locomotive Works; Reuben Wells, Rogers Locomotive Works; H. N. Sprague, Porter Locomotive Works; A. J. Pitkin, Schenectady Locomotive Works; Joseph Lythgoe, Rhode Island Locomotive Works; F. J. Leigh, Canadian Locomotive Works; D. A. Wightman, Pittsburgh Locomotive Works; H. Tandy, Brooks Locomotive Works.

5. *Tests of Steel and Iron.*—To investigate the critical temperature of steel and iron. Also any other questions relating to steel and iron that the committee may consider of value. William Smith, J. N. Barr, A. W. Quackenbush, P. H. Peck, D. L. Barnes.

6. *Uniform Locomotive Performance Sheets.*—To report on the practicability of establishing a system for recording the performance of locomotives that will fairly represent the work done. George F. Wilson, J. S. McCrum, John Player, James McNaughton, John A. Hill.

7. *Standard Bolts and Nuts.*—To report on the best taper for bolts, and the proper size of nuts, rough and finished. Also a report on accurate measuring gauges. Wm. Swanston, Wm. Garstang, T. W. Gentry, W. Lavery, A. Dolbeer, L. R. Pomeroy.

8. *Boilers for High Pressure Locomotives.*—J. M. Boon, H. D. Gordon, J. S. Graham, J. H. McConnell, W. H. Marshall.

9. *Air-brake Standards and Inspection and Care of Air-brakes.*—R. C. Blackall, G. W. Stevens, David Clark.

Committee on Subjects for Investigation.—J. Davis Barnett, George Gibbs, William Smith.

Revolutionizing Locomotives.

Milwaukee, Wis., appears to have generated a great tendency to revolutionize things in the locomotive line lately. It was only a month or two that we were called upon as disseminators of mechanical news to inform our readers that some parties were going to leave in the shade all common locomotives by running engines with wheels built two stories high. Now comes a press dispatch item which says:

"The Chicago, Milwaukee & St. Paul Railway Company are building at their Milwaukee shops two new engines which promise a revolution in locomotive building. The engines consume their own smoke and have no smokestack. They are fitted up with an electric headlight, which is placed on a stand immediately in front of the boiler, thus giving the engineer an unobstructed view of the line ahead. The drive wheels are larger than on the ordinary locomotive and intended for greater speed. The new engines are particularly designed to furnish power for lighting passenger trains with electricity and for furnishing steam heat. These engines will be used on the run between Milwaukee and Chicago, and it is intended to reduce considerably the best time now made. They are designed and being built under the personal supervision of A. J. Smith, a practical engineer, from the shops of the Pennsylvania road at Fort Wayne."

We have seen several locomotives with very minute apologies for smokestacks, but taking that useful appendage away altogether is indeed revolutionizing things. We once saw a man with a leather nose, but still it was a nose. Is there not some such metamorphosis with this smokestack business?

A Big Cylinder.

The Richmond Locomotive and Machine Works lately cast a cylinder 7 × 8 feet for the Newport News Dry Dock and Ship Building Co. The casting weighed 38,000 pounds and they were five and a half hours pouring it. A Southern paper, commenting on this performance, says: "There are not many shops in this country where such a ponderous cylinder could be cast and finished; but as the iron industry of the South increases and auxiliary industries are established, it may be expected that this achievement will later on be dwarfed by others of much greater magnitude. There are no limitations to the South's ability to do whatever can be done elsewhere in the world. Every success like that above noted gives the confidence needed for greater undertakings in the future."

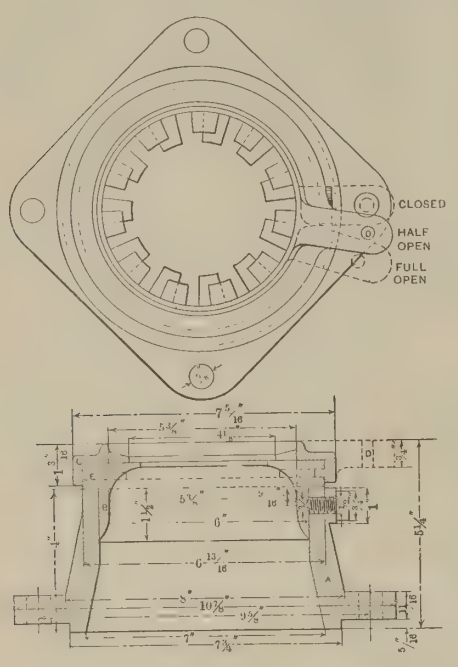
An Ideal Brakeman.

A brakeman belonging to a train on the Long Island Railroad actually went back flagging to protect a train one day last month. He was a good brakeman and therefore he nearly died young. Like nearly all men belonging to the braking profession, he was tired, and as a matter of course, he sat down after he toiled back 551 feet, and he no sooner sat down than he fell asleep. His snores drowned the voice of the whistle requesting his return and he continued to slumber sweetly while the train went its way towards the malodorous perfumes of Long Island City. He continued to sleep with the rail for a pillow and he only slightly raised himself when a train came along, and the engine whistle yelled with a noise that might awake a dead man who did not happen ever to have been a brakeman. The pilot of the locomotive succeeded in wakening James Underwood, our particular brakeman, and it nearly sent him to a more protracted sleep at the same time. But James has a thick skull which did good service to its owner who is again ready to go out flagging.

A St. Paul man has secured a patent on an improvement to the link motion designed to accelerate the movement of the valve at the beginning and end of its stroke. The upper end of the rocker arm works in a swinging block, which gives motion to a supplementary arm to which the valve stem is connected.

Mertsheimer's Variable Exhaust Nozzle.

The annexed engraving illustrates a form of variable exhaust nozzle invented by Mr. F. Mertsheimer, assistant superintendent of motive power of the Union Pacific and used with decided success on several locomotives belonging to the company. The variable opening is obtained by the use of circular plates having notches cut round the edge



of the opening. When the notches of the upper plate coincide with the notches of the lower one the greatest amount of opening is obtained. By sliding round the movable plate the openings between the projections can be closed or partly closed, thus reducing the area of the nozzle. Well designed attachments are provided so that the nozzle can be operated from the cab. Any railroad man wishing to try this form of nozzle can obtain full particulars respecting it from the inventor, whose address is Cheyenne, Wyo.

The Ostrich Mechanic.

A tale of ancient travelers was that the ostrich when chased to extremity pushed its head deep into the sand and fondly imagined that by blinding itself the impending danger would be averted. Modern travelers and the ostrich farmers of the Pacific Coast inform us that the pretty story is a fable, and that the ostrich when pushed to extremities is given to scratching the eyes out of its pursuers with steel-like claws. This is an iconoclastic age, and the most touching of traditions must be thrown to the earthy ground; but I am in a position to vindicate the veracity of ancient travelers in this story of the ostrich. The habits of the old bird were faithfully described, and the reason why the modern feather-raisers do not live up to the habits of their ancestors is, that a case of psychical transmutation has taken place, one of their mental idiosyncrasies having been transmitted into certain entities of the genus homo. That is putting the case technically, as my friend Lauder would say. In plain terms, the head-hiding tendency has passed from the ostrich to men.

When a profound student of psychology first directed my attention to this strange fact I was disposed to doubt the truth of his conclusions: but a little observation has convinced me that his deductions were not only correct, but that there are many examples to be found in railroad life. The dawn of conviction overtook me after spending a day with a master car builder in his shops, which are of the nondescript order, with various additions, consisting mostly of dark nooks, the ancient tools being set in any spot where a belt could be most conveniently made to reach them. This man was building new cars, passenger and freight, and he was full of the saving effected for the company by having the cars built in their own shops. The man was evidently sincere in his convictions and honest in his conclusions, but he had a horror of figures. When I attempted to establish a basis for reaching a rigid estimate of the cost of the cars the man in charge buried his head in the sands of ignorance and refused to see anything, only he felt that he was safe, and the brightest kind of a business adviser for his management. Then I realized that I had found an ostrich mind.

Where discoveries of this kind once begin it is wonderful how rapidly they increase. I next happened upon a railroad shop where business was rushing and they were working overtime to meet the demand for repairs. The man in charge was anxious to know where he could pick up a few good machinists. In the toolroom I found several men making taps and dies and reamers and other small tools. There were also to be seen in the place a variety of home-made gauges. I put the question, "Why do you not buy these tools and gauges and employ your men on repairs?" "We could not afford to do that," was the answer. "They cost you more than they could be bought for, from those who make a specialty of manufacturing these tools, I ventured to assert." "That cannot be," replied the man in charge; "why, we do not feel that these things cost us anything. The men are paid with the others and the tools are there for doing the work, and making a few taps or dies does not increase the pay-roll a cent." That was conclusive, but I reflected that the ostrich hypothesis had a good foundation.

As the peripatetic drummer wended his errant way through the railroad shops in the land, he met with numerous persons who were much fonder of pushing their intellects out of sight than of looking uncertain facts squarely in the face. The mechanical departments of railroads are supposed to be controlled by the sentiments of common sense, and a very obvious sentiment of this kind is not to expend more for labor and material to make a thing than it can be bought for finished, in the open market. Where this rule is habitually violated, we know that something is wrong, and the mistake is generally made by having an ostrich-minded man in charge, who conceives blindness to mean safety. There are railroad shops where locomotives and cars can be built as cheaply as they can be bought, but these places are not so numerous as they are reputed to be. It may be good policy for a railroad company to build annually a limited number of locomotives and cars at a greater cost than what they could be bought for, because men and tools can be kept at work with greater regularity than is often practicable on repairs alone. But when railroad shops undertake to compete with a manufacture as a regular thing, the cost ought to be very rigidly computed.

Among recent products of railroad shops I have lately been introduced to two planers, three grinding machines, one boring mill, one bulldozer, one hydraulic press, one electric dynamo, one band saw, and no end of small machines that may be purchased from special manufacturers. In most cases special patterns had to be made for a single machine. When the question of cost was raised the answers indicated that no attempt was made at finding out how much was indirectly paid for the articles. In other cases a portion of the outlay was figured as the whole. Then I concluded that the ostrich mechanic might most frequently be found in charge of the railroad shops where they take pride in building machine tools. An apparent peculiarity about the product of such shops is that it is greatly inferior to articles that could be purchased from a manufacturer for much less than the cost to the railroad company.—*Sam Short.*

The Niles Tool Works, of Hamilton, Ohio, have recently issued one of the most complete catalogues of machinists, tools ever published. It is made up of 242 pages and shows almost every style of tool manufactured by this well known firm.

The "Supplement" to THE NATIONAL CAR AND LOCOMOTIVE BUILDER was published in August, making its eleventh annual appearance. It gives a great deal of information not to be obtained in any other publication, and the railroad officials to whom it is sent find it a very handy reference when purchasing supplies.

Messrs. Reuter & Mallory, of Baltimore, Md., have received some large orders for their dust guard for axle boxes. The demand for them is rapidly increasing.

The National Lock Washer Company, of Newark, N. J., have met with great success in the introduction of their lock washers for car, locomotive and track work. They have a very complete plant and are able to turn out 100,000 per day. Their new factory covers a space of 65 × 168 feet, and is fitted up with the latest improved labor-saving machinery.

The Berry & Orton Company, of Philadelphia, are making rapid progress with their new five-story brick building, and expect to have it ready by the middle of September. They are very busy with several new designs in wood-working machinery. Some of them are for the Madison Car Works at Madison, Ill.

The Morton Safety Heating Company, of Baltimore, Md., has received a contract from the Belt Line, of Toronto, Canada, to equip all of their new cars with the Morton Heater (stored heat), and the material has already been shipped to do the work. The Rapid Transit Company, of Baltimore, have arranged to have all of their cars fitted up to use this system of heating.

The E. L. Bushnell Spring Company, Limited, of Poughkeepsie, N. Y., have issued a very neat illustrated catalogue of their car seats and car seat springs, also showing their spring mattresses as adapted for sleeping car berths, etc., etc.

The Q. & C. Company have a poetic rooster in their back yard which has lately been heard crowing in the mornings of these sweltering nights. Hot nights at the torrid equator kept sleep from a huge alligator, nor could he repose till he rigged on his nose an effective small Globe ventilator.

The Taylor Iron and Steel Company has been formed by a reorganization of the Taylor Iron Works of Highbridge, New York. The officers of the new company are: Lewis H. Taylor, president; Robert E. Jennings, vice-president; W. J. Taylor, general manager; T. F. Budlong, secretary and treasurer. This company is the owner of the Hadfield system of steel making and intend to operate it in the manufacture of solid steel wheels. Wheels made under the Hadfield process have shown most remarkable tests for strength and solidity of the material.

The Jackson & Sharp Co., car builders, of Wilmington, Del. are building a number of cars for South America and Europe, also 10 passenger cars for the Chicago & Grand Trunk Railway and four (Pennsylvania standard) for the Allegheny Valley Railroad.

E. M. Taylor, of Wilmington, Del., manufacturer of "Fiberoad," for dust guards, etc., etc., report business as very satisfactory; they number some of our best railroad companies among their customers.

Every part of the world where machinery is used is dotted with agencies for the Magnotia Anti-friction Metal. Wherever a bearing is inclined to run hot this metal is in demand as a certain preventative. The best customers are makers of dynamos and other electrical machinery that has to be run at high speed, railroad companies, rolling mill companies, high speed engine makers and all others that have bearings hard to keep running cool.

Any person or company in want of any kind of office furniture or fittings should send to the Globe Company, Cincinnati, for their illustrated catalogue. Besides illustrations of all the most convenient and elegant desks that could be conceived, the catalogue contains cuts of a multitude of minor office conveniences such as files, indices, pigeon hole cases, book racks and cases, cabinets without end and every conceivable invention for reducing the work of an office and for keeping the papers in referable shape. The catalogue will be sent free to any one on applying for it.

A railroad bell cord that is always in need of splicing is a nuisance, and one that keeps breaking is a source of danger. Those who use the Samson solid braided bell cord escape this source of annoyance and danger, and have in use an article which is much cheaper in the end than the inferior cord of the thoughtless purchaser. The Samson Cordage Works office is at 115 Congress Street, Boston.

The American Steel Wheel Company wish to inform our readers that they have at their office in the Central Building, No. 143 Liberty Street, New York City, an interesting exhibit of solid steel locomotive, driving, truck and tender wheels; also solid steel car wheels of various sizes, which all interested persons are cordially invited to inspect. These wheels are making making remarkable records, and it is believed they will equal in mileage any of the steel-tired wheels.

Mr. H. A. Wheeler, Chicago, manufacturer of coach and reclining car seats, writes that a notice in this paper about cars belonging to the Missouri, Kansas & Texas was liable to lead readers to believe that another seat was used when they were in fact furnished with the Wheeler Reclining Chairs.

Messrs. Byram & Co., exclusive manufacturers of the *Colliau Patent Cupola Furnace*, are now executing the contract for two of their large size Colliau cupola furnaces for the Grant Locomotive Works, Chicago, Ill.

This company recently supplied the U. S. Government with the third cupola furnace, this last being for use at the Watertown Arsenal, Watertown, Mass.

Safety of the Frost Lighting System.

We have received from the Railway Lighting and Manufacturing Company copies of voluminous correspondence respecting attacks made on the Frost dry carbureter system of car lighting by the *Engineering News*. We regret that we have not space to publish the correspondence. The *Engineering News* tries to make out that the Frost system is not safe, but we do not think that anything has been proved that the system is not as safe as any other. The tests made by the Pennsylvania Railroad Company certainly point to this conlusion, and they are extending the use of the Frost system, and it has been lately applied to several Pullman cars. We are satisfied that nothing has been shown to question its safety.

Pratt & Whitney's New Shop.

The Pratt & Whitney Company, Hartford, have lately put up a new building 300 × 45 feet. It is two stories and a basement, with an extreme height of 50 feet. The material is brick with stone foundation and slate roof. The timbers are of southern pine and the floors are five inches thick, with the top layer of one-inch maple. The stone foundation is 30 inches thick and the brickwork 24 inches on the first story and 20 inches and 16 inches respectively on the two upper stories. Sixty-seven feet from the entrance, running across the building, is a heavy fire wall 12 inches thick, pierced with doorways which will be closed with fireproof doors.

In the rear end of the basement, which has a cemented floor, is located the wash room, with four large sinks arranged to give an independent water supply to each man. Individual clothes lockers are provided, one for each operative, with lock and key. Power will be supplied by a 70 horse power Harrisburg ideal engine, located in the basement. The rest of this part of the building will be used for genera storage. All the steel used for making tools will be delivered and cut up there.

The first floor will be occupied by machinery for the general manufacture of small tools, of which the Pratt & Whitney Company make about 2,500 different kinds.

The front end of the second floor, south of the fire-wall, will be used for the storage of finished tools, of which the company carries a stock valued at about $125,000. North of the wall the floor space will be used for tempering, grinding and general finishing. There are two elevators in the building, one at the north end, run by steam, with a capacity of two and a half tons, and a hydraulic lift near the entrance at the south end.

The building will be in charge of contractor James E. Woodbridge, general superintendent of the small tools department, who is also one of the directors of the Pratt & Whitney Company.

Centrifugal Grinding Machines.

A review of tool grinding machines adapted to general every day use and to all classes of mechanics seems to reveal the fact that no very decided improvement has been made for many years.

When a grindstone or emery wheel is used for grinding tempered tools, it has been found necessary to have them revolve at a very low rate of speed, or else employ water to keep them from drawing the temper; and many ways have been invented and employed for supplying and applying the water, and none have seemed to become more than half way successful. The difficulties have been that if a wheel or stone was revolved at anything more than a quite moderate speed the moment a drop of water was applied it was bound to fly off.

The means employed in the centrifugal grinders to accomplish the purpose are a radical departure from anything which has heretofore been resorted to.

The water is applied to the stone or wheel at a point near its center, and by capillary attraction is caused to stick to the surface and accumulate in quantity until overcome by centrifugal force imparted by the wheel, then commencing to flow in the direction of the point of its largest diameter, which is entirely encircled by a case which catches the water as it flies off, and without the aid of a pump is conducted back to the tank again; the faster the wheel is revolved the more rapid the water flows, and the ordinary rates of speed and amount of water now used can safely be multiplied several times. And this is not all to be noticed in this connection; the water being made to flow on and over the surface of wheel with force, at right angle to its direction of motion, it is not so apt to fly off when coming in contact with the tool, but is inclined to keep on its natural direction of course; and then the current of water keeps the stone clean and becomes more effectual in keeping the tool cool by being held on the surface at the point of grinding contact.

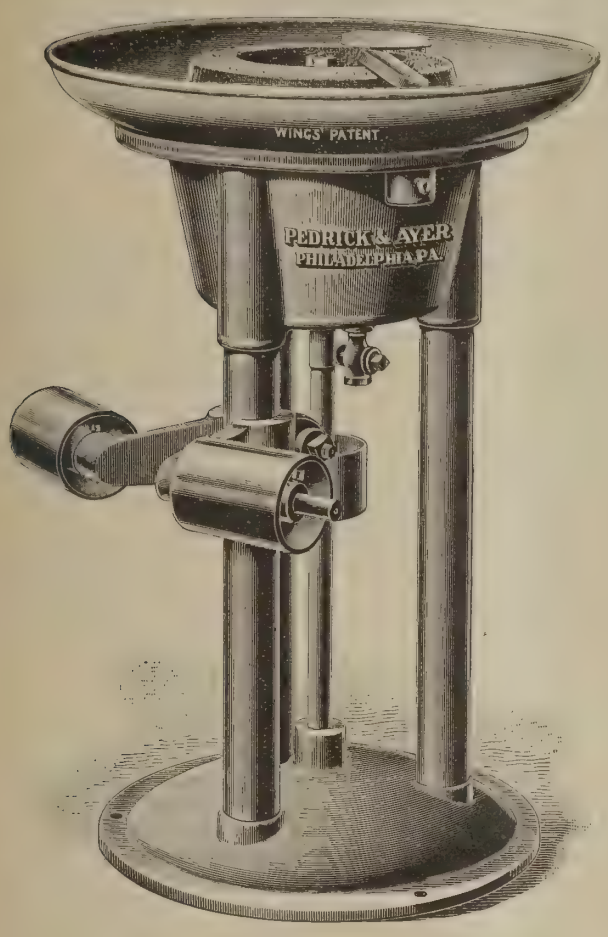
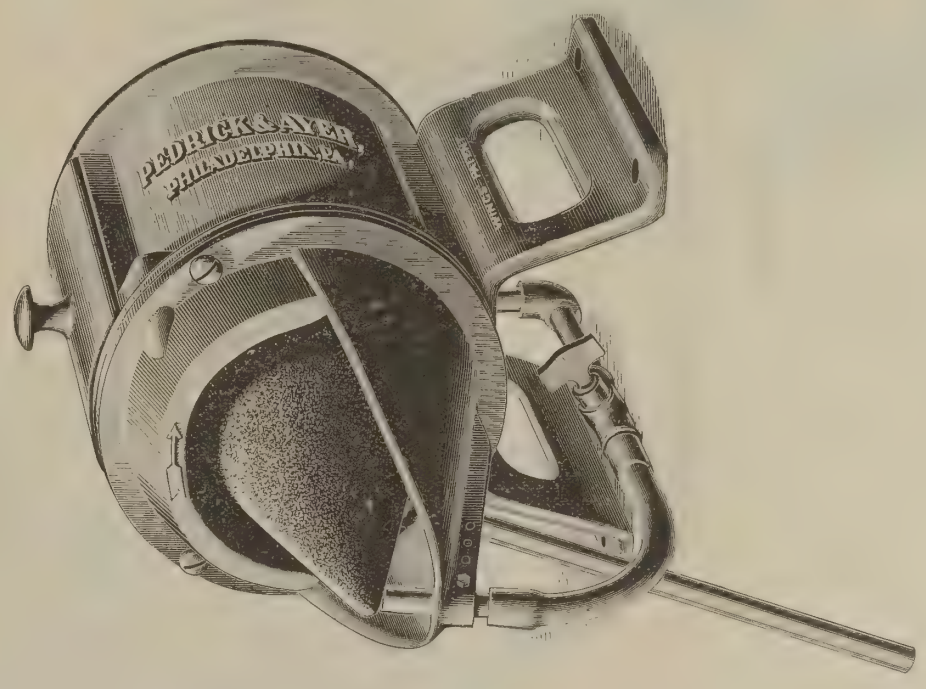


Fig. 1 shows a good specimen of centrifugal grinding machines. This machine carries a single wheel, 12 inches in diameter by 2 inches thick, and is mounted on a steel arbor 1¼ inches in diameter, running in removable bronze bushings.

The grinding face of wheel is slightly beveled to accommodate the grinding of long knives which have to lay across the wheel from one side to the other. It is designed for grinding all kinds of wood working tools having straight-edges like planes, chisels, knives, etc., etc., and is also effective for grinding machinists' and kindred tools, but might be considered by some not quite so convenient as the horizontal machines.

The water is brought onto and carried over the surface of wheel and back to tank again by centrifugal force alone, and so continuously as long as water is kept in tank. This machine is as simple in its construction in every respect as the plainest grindstone frame, supplies itself with an abundant amount of water, is much neater and will do much better and more work.

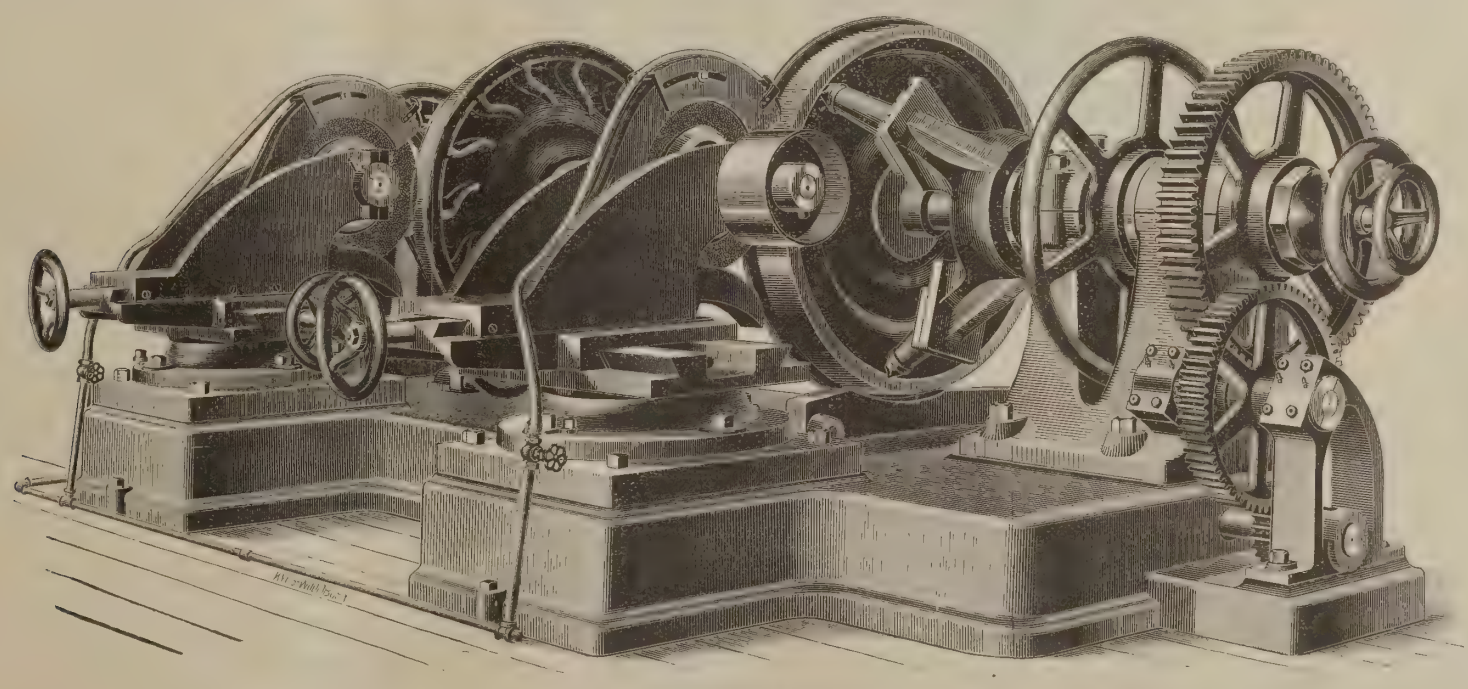
Fig. 2 is a little machine designed for grinding inside gouges, cutters and tools having concave cutting edges, and will grind all such tools to a true arc of a circle within its limits. It will be found more serviceable and effective than a whole gang of wheels mounted in the ordinary way. It supplies itself continuously with an abundant amount of water in the same manner as the machinists' tool grinder. It is thoroughly and carefully made and has steel arbor with removable bronze bushings for boxes, which are self-oiling. This machine is made either single or double, as preferred. This machine is very valuable for grinding, moulding and shaping machine cutters used in car shops and planing mills. These machines are made by Pedrick & Ayer, Philadelphia.



CENTRIFUGAL GRINDING MACHINES.

Chilled Car Wheel Grinder.

Our illustration in this connection is of a new grinding machine for grinding the tread of chilled car or locomotive truck wheels.



CHILLED CAR-WHEEL GRINDER.

The machine consists of a heavy bed plate located even with the floor, upon which two head stocks are firmly secured, one at each end of the plate. Each of these heads is provided with three spindles, which work one inside of another, and the spindles are simultaneously revolved by powerful gearing and a shaft running under the bed plate. The inside spindles carry the centers and support the wheels. They are horizontally adjustable to any length of axle by the hand wheels at the back of the heads. The second spindles carry the gear wheels and impart the revolving motion to the inside as well as the outside spindles by means of keys. The outside spindles which carry the clamping arrangement are horizontally adjustable by the large hand wheels located in the middle of the heads. The clamping heads are provided with three arms having radially adjustable yielding contact points, which are forced against the wheels by the large hand wheels and take hold at the under side of the rims. The contact points are made of tool steel, shaped in two edges, and conform themselves to any irregularities in the shape of the wheels. By these contact points the wheels are driven, and as they are capable of adjustment to the wheel independently of the spindles, which carry the centers and support the wheels and axles in place, these latter can be so adjusted as to bring the wheels into proper position relatively to the grinding wheels, regardless of the distance the axle projects outside the wheels, or even if there is no such projection. The contact points are also readily adjusted radially for different sized wheels, and as the driving is by both wheels and near the tread it is found that the motion imparted to them is steady and sufficiently powerful to enable the heaviest grinding to be done where circumstances call for it without vibration or jar. On one side of the bed plate are placed the heads which support the grinding wheels. These heads have two slides for regulating the cut, and pains have been taken to so design and proportion the heads as to do away with all liability of springing.

A short track is located under the car wheels and is provided with a cam arrangement by means of which the car wheels and axles are lifted up to the center of the spindles and held there until secured, when the cams are lowered, and the wheels will swing free of the rails. By this arrangement the man that operates the machine is enabled to exchange wheels in three or four minutes.

A tank is formed in the base of the machine for water, from whence it is taken by a centrifugal pump, and by suitable piping carried to the wheels, valves being put in for regulating the flow. The pump has a capacity to furnish an abundant supply of water, as it is found advantageous to supply water freely, the wheels cutting better without heating the work. An adjustable hood nearly surrounds the wheels and prevents the water flying, and the top of the bed slopes toward the center, so that the water flows to the tank to be used again.

The machine will grind from six to eight pairs of new wheels, or five to seven pairs of old wheels, in ten hours, at a total cost of 24 to 28 cents per wheel, including labor, cost of wheels, oil and all other items of expense, and the experience of the Pennsylvania and other roads with ground wheels shows that such grinding pays well, especially for passenger service. The machine is made by the Springfield Emery Wheel Manufacturing Company, Bridgeport, Conn.

The Two-Coil Baker Car Heater.

Mr. Baker, the original inventor of the Baker car heater, also the inventor of all improvements that have been made on it, has, for the past four winters, been making actual tests, with the view of accomplishing this much desired object, and in the most simple, inexpensive and practical manner.

The engraving of this device is plain enough, we believe, to be readily understood and appreciated by any one conversant with the construction of Baker car heaters.

The two generator coils here shown as applied to our flexible steel, fire-proof heater are equally applicable to the other Baker car heater.

It will be seen that the additional coil takes the place of the cast-iron lining of the Baker heater fire chamber, and utilizes the heat otherwise lost. Hence, the outside of the heater is cooler than with the old style Baker heater.

Two of our expanding generator coils are here employed; and the two circulations are thereby still further facilitated, as the internal size of the coils increases, from the bottom, upward, proportionally as the water within them is expanded by the fire.

The water is fed to the heater in the usual manner, both circuits being supplied at the same time. Small holes in bottom and top of the partition, or stay, cast crosswise in center of drum allow equalization of both the water and the pressure.

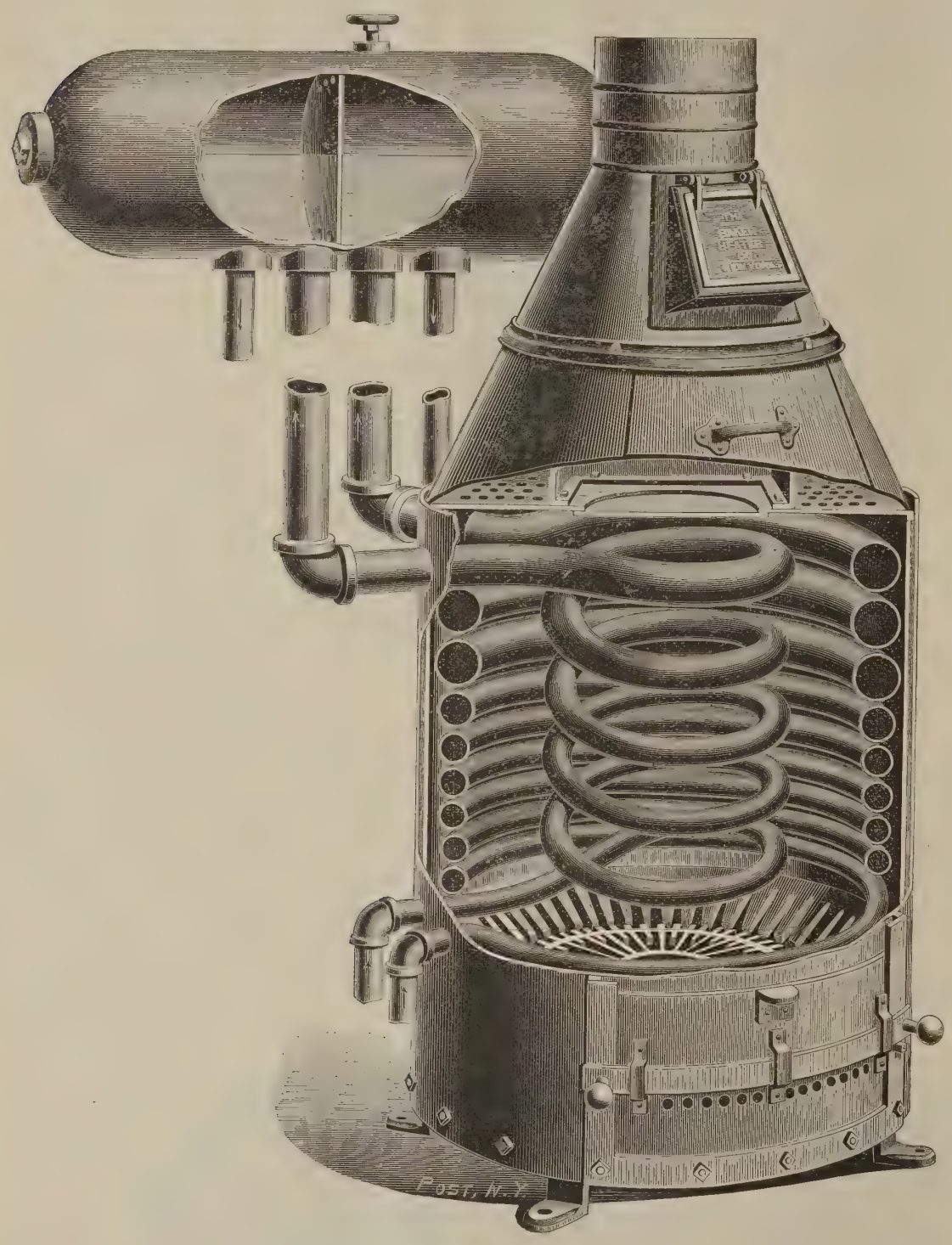
The fire grate is the same as in the "perfected" heater, but the grate surface is extended by openings in the rim of the "ash pit," as shown.

With these two coils, the coal will kindle as readily, burn as freely, last as long, and leave as few clinkers, as with any other heater whatever. These are very important desiderata, and their absence—the non-maintenance of a proper fire—have caused the failure of all previous attempts to use two coils in one fire.

This new circulation system has even more than double the heating power of the single circuit, for the reason that each of the two short circuits returns to the fire (their source of heat), *twice as often* as the one long circuit, and one of the circuits has no "crossover" "pocket" to contend with.

The outside, the larger of the two coils, is 46 feet three inches in length, gradually increasing from 1¼ inches (the usual size pipe of Baker heater coils) at the bottom to two inches at the top end, at which point it turns upward to the circulating drum. The inner coil is 16 feet long, and of the same proportions.

Comparing the heating capacity of these two generator coil, with the old style, having 15 lineal feet, of 1¼-inch pipe, this heater has two coils equivalent to 75 lineal feet of 1¼ pipe. It will heat a car twice as quick as by any other Baker heater. It will warm the largest car in the coldest day of our coldest climate. The sole owners and manufacturers of this heater are the Baker Heater Company, New York.



TWO-COIL BAKER HEATER.

A report was recently made to General Manager Stevens, of the Chesapeake & Ohio, on the cost to the company of lighting by the Pintsch system. The figures showed that the cost per light per hour averaged 1.86 cent. There was no difficulty in instructing the employés in regard to the handling of the light.

The Universal Brakebeam Company report an increasing demand for their brake beam by railroad companies. The prospects are satisfactory for getting this beam put on a fair percentage of the new cars that must be built during the coming winter.

Accidents at railroad crossings are so numerous that a practical alarm which will warn people of the approach of a train would be a great safeguard. The difficulty with most of the crossing alarms that have been tried is that they are very ready getting out of order. We recently examined O'Neill's automatic crossing alarm made by the Electric Supply Company, of Cleveland, that appears to have all the causes of previous failure eliminated.

Mr. E. Clark, president of the Standard Car Coupler Company, and Mr. Willis E. Ragan, president of the Thurmond Car Coupler Company, have issued the following notice: We beg to advise you that all conflicting claims and controversies between the Thurmond and Standard Car Coupling companies have been satisfactorily adjusted. The suit between the parties has been dismissed. Each party and company has the right to manufacture and sell, or cause to be manufactured and sold, or authorize others to manufacture and sell, couplers of the kind heretofore manufactured and sold by it, under its own patents, freed and discharged from all claims of infringement that has or can be made by either party against the other.

The Buckeye Automatic Car Coupler Company, of Columbus, O., have received an order to equip 100 60,000-pound coal cars for the Terre Haute & Indianapolis Railroad Company with their automatic car coupler; also 50 refrigerator cars for the Baltimore & Ohio Southwestern Railroad Company.

A Good Man vs. a Good Machine.

A good man, say the Egan Company, is worth what he gets, but seldom gets what he is actually worth. A good man, like a good machine, is always worth good money—the better the man the better value he gives you. The better the machine the greater results in production and efficiency. The Egan Company, of Cincinnati, Ohio, do not build or sell men, but they do build and sell late improved machines for all kinds of wood work, and are in the position to give you the very latest ideas for rapid, accurate and economical work. They are always willing to post you relative to advanced types of wood-working machinery.

A Convenient Cushioned Hammer.

During a visit to Cleveland found a company making what is called the Hackney pneumatic power hammer, which is practically unknown to railroad shops, and yet possesses properties which would make it exceedingly valuable in many of our blacksmith shops. The hammer is operated by a pulley shaft like any ordinary machine tool. Connected with the shaft is a cylinder which receives a vertical reciprocating motion. Inside the cylinder is a piston with a rod connecting to the hammer. The cylinder and piston provide the pneumatic apparatus. At each stroke air is admitted to the cylinder and regulated in a way that keeps the piston constantly floating in a cushion of air. By means of the air cushions and a frictional brake the hammer is thoroughly under control and delivers blows as light or as heavy as may be desired. The Hackney Hammer Company are the manufacturers.

Advantage of Automatic Lubricators.

In a report made to President Maurel of the Atchison, Topeka & Santa Fe on the value of automatic sight feed lubricators for valves and cylinders, the statement was made that engines equipped with the Nathan sight feed showed a saving of 20.7 per cent. of the amount of oil used by engines having the common hand cup. It was also stated that the engines having the continuous lubricators were more efficient when working on grades, and that the wearing parts of valves, valve seats, cylinders and piston packing required only one-third of the usual repairs when automatic oilers were in use.

A report on the same subject to Mr. Whitman, general manager of the Chicago & Northwestern, says that the reduction in the cost of lubricating valves and cylinders had been reduced at least $50,000 a year by the introduction of the Nathan sight lubricator. In addition to this the report says that increased efficiency of locomotives is secured when a continual feed of oil is supplied. The advantage of automatic lubrication is particularly apparent in large locomotives with the great area of valve and piston ring surface that requires to be kept moist with oil.

Our Directory.

Atlantic & Pacific.—D. B. Robinson, general manager, has resigned.

Baltimore & Ohio.—R. B. Campbell has been appointed general superintendent of trans-Ohio divisions, vice Edward Dickinson, resigned.

Brooklyn, Bath & West End.—John M. Butler, president, has resigned.

Flint & Pere Marquette.—W. A. Potter has been appointed superintendent, vice Sanford Keeler, resigned.

Grand Rapids & Indiana.—Sylvanus D. Bradley, master mechanic, died at Grand Rapids, Mich., July 23, aged 54 years.

Great Northern.—Joseph W. Blabon has been appointed Purchasing Agent, vice J. C. Morrison, resigned.

Lake Shore & Michigan Southern.—R. F. Rumberger has been appointed Division Master Car Builder of this company on the Toledo Division, with headquarters at Norwalk, O. Thos. Fildes has been appointed Division Master Car Builder of the Western Division, with headquarters at Englewood, Ill. F. O. Bray, Division Master Car Builder at Adrian, Mich., will have jurisdiction on the Michigan Division.

Louisville, New Albany & Chicago.—W. H. Folsom, Purchasing Agent, has resigned.

Mexican National.—Louis H. Sherman has been appointed Master Mechanic of Southern Division.

New York Central & Hudson River.—W. W. Thompson has been appointed master mechanic, vice P. Mc Q. Gibson, resigned.

New York, Lake Erie & Western.—T. A. Lawes has been appointed master mechanic of the Eastern division, with office at Jersey City, N. J.

Oregon Pacific.—C. C. Hogue has been appointed auditor and purchasing agent.

Richmond & Danville.—The office of superintendent of motive power, R. D. Wade, has been removed to Atlanta, Ga.

St. Louis, Alton & Terre Haute.—J. W. Stokes has been appointed master mechanic and master car builder, vice P. H. Murphy, resigned.

Wanted.

WANTED.—Second-hand passenger coach, not less than 60 ft. long. Address, with price, which must be reasonable, F. G. PRESCOTT, Adams House, Boston, Mass.

NATIONAL CAR AND LOCOMOTIVE BUILDER

OCTOBER, 1891.

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The Lake Erie & Western has contracted for 500 new box cars.

The Wabash has just contracted for the building of 300 new coal cars.

It is rumored that the Boston & Albany are about to build 1,000 new box cars.

The Savannah, Florida & Western are about to order 500 cars and 30 new locomotives.

The Richmond & Danville are to add a line of new machinery to its shops at Macon, Ga.

The Pittsburgh Locomotive Works will add a large machine shop to its works in Allegheny.

A Pullman sleeping car conductor has been arrested at Shreveport, La., for violating the law in permitting a colored passenger to ride in his car.

The limited express on the Pennsylvania made up over an hour between Fort Wayne and Chicago one day lately. With six heavy Pullman cars the engine ran 64 miles in 62 minutes.

The New England Railroad Club held the first meeting of the season in a retreat on Rhode Island. A clambake, for which that region is famous, was the exercise indulged in by the members of the club.

The Canadian Pacific Railway Company are preparing to equip all their passenger train cars with the Westinghouse quick acting brake. They also intend to apply brake shoes to all the wheels of six wheel trucks.

During the last year the Illinois Central Railroad has added to its rolling stock equipment 74 new locomotives, 81 new passenger cars and 1,300 new freight cars. They have also purchased 69 ballast cars of a peculiar pattern.

The Pennsylvania Railroad Company are preparing to make an exhibit of railroad machinery at the Columbia Exposition worthy of the high standing of the company. The locomotives and cars intended for exhibition will be built at Altoona.

The Fitchburg Railroad people are building twelve new passenger cars in their shops at Fitchburg. Mr. Marden says that the cars will be the finest they have ever built. The shops are very busy with freight-car repairs and they expect soon to begin building a large number of new freight cars.

Among the hotel keepers who invited the Joint Committee of the Master Car Builders' and Master Mechanics' Associations to make their places the headquarters of next Convention was a man in Chautauqua who made an appeal to New Jersey men by alleging that his place was entirely free from mosquitoes.

There is a wonderful little locomotive on the London & Northwestern Railway called the "Charles Dickens," engine No. 755, and on Sept. 19 it completed its 1,000,000 miles. It was built Feb. 6, 1882. It made a daily mileage of 362 miles. It has never had a breakdown, and runs from London to Manchester and back.

There was a disastrous locomotive boiler explosion on the Long Island Railroad last month instantly killing three men. The boiler ruptured on the connection sheet in front of the fire box. Of course the accounts of the explosion given out by the press dispatches attributed the explosion to low water in the boiler. That explanation is sterotyped and it serves on all occasions.

An express train on the Missouri, Kansas & Texas was robbed of $2,500 by armed men at Leliaetta, I. T., Sept. 15. The train crew were covered with revolvers while two of the men entered the express car and tried to compel the messenger to open the large safe. After he convinced them that he was not able to do so they broke open the small safe and took all the money it contained.

Steel treated by the Harvey process, which gave such extraordinary results in resisting shot during tests made by the U. S. Government, is about to be introduced for various railroad rolling stock purposes. The Pennsylvania Railroad Company intend to put in use as an experiment some crank pins and tires made of Harvey steel. Those familiar with the steel hold that it is peculiarly well adapted for making strong and durable tires.

An association of railway clerks has been formed. The principal article of faith held by the association is opposition to strikes. That is not a particularly strong bond of union. It is not an unwise plan for the class of railroad employees that could be discharged in a body without stopping the operation of the road, to declare that strikes are unwise and unsatisfactory. This is most decidedly worldly wisdom when those entering into the organization are aware that their bosses are inclined to kick over the stool that the association stands on.

The passengers on a northbound express on the Housatonic Railroad had a narrow escape one day last month. The train was running at a high speed along the bank of the Housatonic River, near Cornwall, when a flange broke and the engine left the track, dragging the cars after it. The engine plunged down the river bank, but the breaking of the coupling saved the coaches. It is needless to say that it was the flange of a cast iron wheel that broke, nor is it necessary to dwell on the moral that cast iron wheels and express speed do not harmonize with safety.

The Pennsylvania Railroad people are preparing to convert five of their heavy freight locomotives into compounds after the Vauclain designs. After they are ready for work they will be put in service to run in competition with simple engines of the same class, and subjected to precisely the same conditions of duty and receiving the same usage by enginemen running on the first in first out plan. If it is found by this experience that compound locomotives can haul trains more economically than simple engines, there will soon be a large equipment of compounds at work.

A committee of train men belonging to the New York, Pennsylvania & Ohio divisions of the Erie have investigated the cause of the Ravenna accident and have concluded that the crew of the passenger train were not to blame, although they were censured by the coroner's jury. This agrees with the views we took of the accident at the time it happened. The committee have requested that the crew be reinstated, and they are urging their request upon General Manager Tucker. If Mr. Tucker was a just manager there would be no necessity for the investigation of this committee.

J. E. Smith, who was messenger in charge of the Wells-Fargo express car which was robbed at Samuels, Tex., on the Southern Pacific, Sept. 2, killed two train robbers three years ago near El Paso, Tex., for which act he was presented with a gold medal by the citizens of El Paso. At Samuels he did not open the car door until the roof had been shattered with dynamite, and he had been covered with broken glass and splinters. Upon reaching San Antonio he tendered his resignation, because he said that the life of an express messenger was getting to be too exciting in that far Western country.

When Mr. Manvel became president of the Atchison, Topeka & Santa Fe he had a number of fine dining cars purchased, intending to put them on the leading through trains. When he began running the cars he discovered that a former management, noted for favoring friends, had bound the road to an agreement with a restaurant proprietor to stop trains at certain eating houses along the line. The case was put in the courts and the proprietor of the station restaurants and eating houses has secured from the courts a perpetual injunction restraining the road from running dining cars west of the Missouri River.

There are 413 species of trees found within the limits of the United States and Territories, 16 of which, when perfectly seasoned, will sink in water. The heaviest of these is the black ironwood, found only in Southern Florida, which is more than 30 per cent. heavier than water. Of the other 15, the best known are the lignum vitæ and the mangrove. Texas and New Mexico lands are the homes of a species of oak which is about 1¼ times heavier than water, and which, when green, will sink almost as quickly as a bar of iron. It grows only in mountain regions, and has been found westward as far as the Colorado desert, where it grows at an elevation of 10,000 feet.

An excellent powder for welding wrought iron is described by a German contemporary. It consists of borax, 50 per cent.; sal ammoniac, 25 per cent., and water, 25 per cent. This mixture is boiled, being at the same time continuously stirred until it is reduced to a stiff mass, which is then held over a fire until it is hard. When cold the mixture is well pulverized and assimilated with one-third part of rust-free wrought iron filings. The pieces to be welded are then heated to redness, when the powder is strewn over them and allowed to liquefy over the fire. Only very slight blows are then required to consummate the perfect conjunction of the pieces.

Some railroads in New England are experimenting with a substance called "Kem Kom" which is mixed with the coal and is supposed to prevent smoke and increase the water evaporating power of the fuel. On a railroad where we were informed it was performing wonders, we made several trips on locomotives and found that they were making very little smoke, but we also noted that the engines were fired with the greatest skill and that the fireman kept the firebox door on the latch nearly all the time. On other engines where the smoke preventer was not used the firing was of the usual careless order and the smoke raised was nearly reaching the nuisance degree. Any kind of a smoke preventer, even if it should be loaded with a ridiculous name, is certain to be a success with a fireman who knows his business.

Vice-President Frank Thomson, of the Pennsylvania Railroad, is an observant business man of wide experience, and that which he has to say after a tour of the Northwestern States respecting crop prospects and the effect of a large yield on railroad business is of special interest, because it comes from a good authority. He says that the published accounts of the enormous crops are not at all exaggerated, and that throughout the Northwest he passed thousands of acres of wheat in perfect condition, the crops being greater in acreage, more wheat to the acre and better in quality than ever before. The railways, Mr. Thomson is quoted as saying, will be taxed to the full capacity of their equipment for months to move this tremendous tonnage. He found the railway managers of the Northwestern lines all fully alive to the situation and making every possible arrangement to meet the unusual demands upon them. The changes in the far Northwest brought about by the opening of James J. Hill's Great North Railway, Mr. Thomson says, are wonderfully striking, and the extension of that line to the Pacific Coast will make one of the most prominent arteries of the traffic across the continent.

The railroad rolling stock question is in a very peculiar condition at present. The crops in every part of the country have been bountiful to an unprecedented extent and the general business of the country is flourishing, yet work in the locomotive and in the car-building establishments is said to be dull. There are car famines causing endless inconvenience in every point where shipments have to be made, and loaded cars block miles of yards in many places because there are not enough locomotives to keep trains moving. Railroad stocks are going upward very rapidly and it looks as if railroad managers had combined to purchase no new rolling stock till delay begins to drive away their business. In connection with the scarcity of cars in the West there are loud complaints that certain New England roads are not furnishing their fair quota of cars for moving the harvests. The complaint is made that these roads are depending on the cars that bring in grain from the West to take all the freight going from the seaboard and that the cars are held to be loaded when they ought to be returned empty promptly. We expect that before Christmas there will be a deluge of orders placed for locomotives and cars calling for immediate delivery. This will be merely repeating a practice that is as old as the days of railroading.

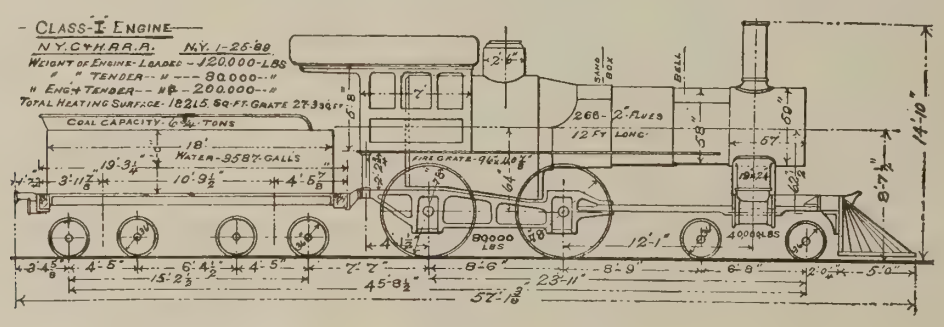
Tests of car wheels made by the Marshall Car Wheel Co., Marshall, Tex., were made in the presence of Mr. J. F. White, Master Mechanic of the Union Pacific at Fort Worth, which appear to show that the makers are using a remarkably tough mixture of iron on their car wheels. A local paper describing the tests, which were the standard M. C. B. drop, says: The first blow made no impression; neither did the second, third fourth, fifth and sixth. At the seventh blow a crack was noticed; eighth, two slight traces of cracks appeared; ninth, no change; tenth, traces of cracks extending were noticed; eleventh, the force of the blow was increased; no change could be seen up to the twentieth blow; twenty-first, the cracks seemed to be extending; twenty-second, twenty-third, twenty-fourth and twenty-fifth, no change could be discovered; twenty-sixth, with this blow the plate around the hub broke in three pieces, but did not fall out. A close examination of the wheel was then made, but no defects could be seen in the hub or rim. The wheel was then placed with the rim resting in such a manner as to receive the full force of the blow, but several drops were required before it could be broken. When it was finally done a careful examination of the chilling of the rim was made, when it was found the chill was about an inch or a little more in depth and was very even, at no portion of the rim or flange being lighter.

Fastest Long Run Ever Made.

ACCURATE FIGURES OF THE RUN.

The mountains whose ranges and arms encircle the region of New York City make a hard way to travel for the railroads that attempt to go directly westward. The only fairly level pathway out of the great natural amphitheatre is by the water line of the Hudson River, the route followed by the New York Central & Hudson River Railroad. This company has a practically level road from New York to Lake Erie which gives it advantages for speed making, and for train movement possessed by none of its competitors. This has been long acknowledged, but it has only been within the last few years that the officers of the company have exerted themselves to reap the benefits that a commanding position has conferred upon the property. Fast trains run at frequent intervals and run on time invite the public to take this natural highway to the West and the men in charge have lately got in the habit of letting travelers know that the New York Central carries passengers. This is a decided change.

On several occasions within the last three months it has been necessary to run trains at unusually high speed, and the motive power available proved so surprisingly efficient for fast running that Vice-President H. Walter Webb became interested in knowing how fast the locomotives belonging to the company could maintain speed while pulling a train that would accommodate a paying load of passengers. The fastest long run on record was that of the London & Edinburgh express, that had been run 400 miles at an average speed of 55.4 miles per hour with a train weighing 90 tons exclusive of the locomotive. Mr. Webb thought that the New York Central engines were capable of exceeding this performance, and he arranged for a train of 130 tons to be run from New York to Buffalo, a distance of 439½ miles in 435 minutes, exclusive of stops. An accident of a character that must always be looked for in fast train service, especially with a special train, prevented the schedule from being followed to the letter on the last division, but it was demonstrated that a good weight of train can be run between New York and Buffalo without difficulty at a mile a minute running time.



The aim of the officers in charge was to run this fast special as nearly as possible under the conditions that prevail with the regular fast limited trains. The engines used ran trains on the previous day and were supplied with the usual fuel, and the intention was that nothing extra should be done to them in preparing them for the run. A schedule was made out by General Superintendent Voorhees, which called for a running speed of about 70 miles an hour. Mr. William Buchanan, superintendent of motive power, designer of the locomotives used, gave instructions to the engineers to run as closely on the schedule time as possible, making no spurts.

The train left the Grand Central Station, New York, at 7:30 on the morning of Sept. 14. It consisted of engine 870, with two private cars and a day car. The total weight of engine and tender in working order was 100 tons, and the cars weighed 130 tons empty, having been put on the scales the previous day. Mr. Webb's private car was the last in the train, and from the observation room at the rear the records of the trip were made. The party in the car consisted of Vice-President Webb, General Superintendent Voorhees, Superintendent of Motive Power Buchanan, General Passenger Agent Daniels, Superintendent McCoy, Mr. A. G. Leonard, secretary to Mr. Webb; Mr. Burnett, reporter of the New York *Sun*, and Angus Sinclair, editor of the NATIONAL CAR AND LOCOMOTIVE BUILDER. Before starting Mr. Webb requested the writer, as a disinterested party, to keep the record of the run. A schedule had been prepared with the proper time for passing every station. Throughout the whole trip Mr. Voorhees called out as stations were passed, and Mr. Leonard noted the time on one sheet and the writer on another. The particulars on both sheets were found to agree at the end of the journey, and they are given in the annexed table.

Among several of those forming the party there appeared to be an impression that we were going to have a most exciting trip. In reality it was difficult to note any difference from speeding along on a regular limited. The calling of the stations, and the watching to see how close the engineer was holding to the schedule kept up a little excitement and the timing miles with stop watches provided subject for talk, but we slipped along mile after mile with very little variation from 50 seconds, and it seemed as if there was disappointment, that the cars were not lurching round and making people frightened. For the cars to run steadily enough to make dining very comfortable at seventy miles an hour was something entirely unexpected. From what I have experienced of much higher speeds made during short spurts on other runs, I do not believe that any discomfort would be experienced by passengers on a fire road bed like the New York Central if a speed of 100 miles an hour were maintained. Moreover very few of the passengers would realize how fast they were traveling unless they kept time between mile posts.

To those familiar with running trains the trip gave numerous illustrations of the difficulty of forcing trains into the higher velocities. It took eight minutes to run the first 4.38 miles, and then the speed reached was only 45 miles an hour. There are a series of curves about 10 miles out that make very high velocities undesirable, and that may have kept down the speed. The train was 14 miles out before a mile a minute pace was reached, and we had used up 19 minutes in getting there. This made an average speed of 45 miles an hour from a state of rest to a velocity of 60 miles an hour, the last 10 miles being passed in working up from 45 to 60 miles an hour. It took seven miles more of hard steaming to raise the speed to 70 miles an hour. After that speed was reached the engine appeared to have no difficulty in maintaining it. When the speed had to be dropped to scoop up water it took five or six miles to get back to the one mile in 50 seconds pace, which appeared to be the speed aimed at. The run of 142.88 miles to Albany was made in 140 minutes and 14 seconds.

Engine 870, that made the run over the first division, is the first one of a new class of passenger engine designed specially for fast trains. The performance of the engine on this run has induced the company to order several more of the same class. The cylinders are 19 × 24 inches and the driving wheels 6½ feet diameter. The leading particulars are given in the annexed side elevation of the engine. The engines that took the train over the other two divisions had smaller driving wheels than 870, but otherwise are of the same general dimensions. The locomotive illustrated in the woodcut forming the Supplement to this number of the NATIONAL CAR AND LOCOMOTIVE BUILDER is of this class. Engine 870 performed the hardest part of the journey, for there was a stiff head-quartering wind blowing all forenoon; it is a steady up-hill pull all the way; there are a number of sharp curves that were not run at full speed, and speed had to be reduced several times where the track had been washed out and was undergoing repairs. Engineer Kirk handled his engine very well, however, and made his schedule time. He has expressed the opinion that he could make the run in 20 minutes less time.

A change of engines was made at Albany in 3 minutes and 15 seconds, and the train was again speeding along behind engine 876, with engineer Chase at the throttle. There is a steep grade of some 140 feet to the mile, for four miles, out of Albany. A speed of 40 miles an hour was attained on the grade, and 10 miles farther on a speed of 65 miles an hour was reached, and it looked as if this division would be crossed considerably below schedule time. But the engineer appeared unequal to the mental strain of seeing space annihilated at a greater velocity than a mile a minute, and he dropped into that comfortable pace, finishing the run of 147.84 miles 5 minutes and 28 seconds late.

Another change of engine was made at Syracuse, the time consumed in the change being two minutes and thirteen seconds. Engine 862 in charge of Engineer Hogan took the train, and the officials present being familiar with the man and the engine freely predicted that now we would have some fleet running. Hogan started out admirably and six miles out was leaving the world behind at the rate of a mile a minute. Ten miles farther on he was making a mile in 50 seconds and the spirits of the party were rising high, for every one felt assured that the minutes lost on the middle division would be easily made up and Buffalo reached on time. When these feelings of pleasant anticipation were making every one happy, Conductor Rockwell walked in and spoke of a hot box on the engine, and all spirits dropped down to zero. A back driving box on the engine was running hot. Assistant Superintendent of Motive Power Campbell and Traveling Engineer Gould, who were on the engine, labored hard to cool the box with water when the high speed was maintained, but their efforts were unavailing, and a stop had to be made, so that the collar could be packed, at Fairport, half way between Syracuse and Buffalo. This took about eight minutes and the train was going again in great shape. Before six miles were passed the train was running at a mile a minute. The box still kept running hot, but the remainder of the trip was made at the rate of about 65 miles an hour. In spite of the stop and the slow run through Buffalo yard the division of 148.8 miles was run in 155.4 minutes and 24 seconds. On this division miles were repeatedly run in 48 seconds, which was the fastest speed made on the trip.

The distance from New York to Buffalo is 439.52 miles, which was run, including all delays, in 448 minutes and 5 seconds, an average of 58.85 miles an hour. The time really consumed in running was 434 minutes 47 seconds, which made an average velocity of 60.69 miles per hour.

The running time from New York to Albany, a distance of 142.88 miles, was 140 minutes 15 seconds. This was an average speed of 61.2 miles an hour. The distance from Albany to Syracuse is 147.84 miles, which was run in 146 minutes and 58 seconds, an average speed of 60.3 miles per hour. From Syracuse to Buffalo is 148.8 miles. Deducting the delay in the middle of the division, the remaining time was 147 minutes 34 seconds, an average speed of 61½ miles an hour, a particularly good performance considering the drawbacks encountered. A. S.

STATIONS.	Distance from beginning of division.	Distance between stations.	Passed stations. H.	M.	S.	Time betw'n stations M.	S.	Time on division M.	S.
Grand Central Station, left	.....	.....	7	30	....	....	....	.....	.....
125th Street	4.38	4.38	7	38	....	8	00	.....	.....
Morris Heights	8.03	3.08	7	41	30	3	30	.....	
Kings Bridge	9.86	1.83	7	43	40	2	10	.....	.....
Spuyten Duyvil	11.15	1.29	7	45	20	1	40	.....	.....
Riverdale	12.89	1.74	7	47	52	2	32	.....	.....
Ludlow	14.21	1.32	7	49	29	1	37	.....	.....
Yonkers	15.22	1.01	7	50	15	..	46	.....	.....
Glenwood	16.06	.84	7	51	10	..	55	.....	.....
Hastings	19.44	3.38	7	54	15	3	05	.....	.....
Dobbs Ferry	20.71	1.27	7	55	22	1	07	.....	.....
Irvington	22.71	2.00	7	57	10	1	48	.....	
Tarrytown	25.28	2.57	7	59	25	2	15	.....	.....
Scarborough	29.44	4.16	8	03	15	3	50	.....	.....
Sing Sing	30.90	1.46	8	04	39	1	24	.....	.....
Croton Landing	34.42	3.52	8	08	..	3	21	.....	.....
Oscawana	36.41	1.99	8	09	50	1	50	.....	.....
Crugers	37 29	.88	8	10	40	..	50	.....	.....
Montrose	38.84	1.55	8	12	20	1	40	.....	.....
Peekskill	41.29	2.35	8	15	16	2	56	.....	.....
Highlands	46.10	4.81	8	20	17	5	01	.....	.....
Garrison	49.86	3.76	8	23	48	3	31	.....	.....
Cold Spring	52.56	2.70	8	26	15	2	27	.....	.....
Storm King	54.61	2.05	8	28		1	45	.....	.....
Dutchess Jun	57.26	2.65	8	30	24	2	24	.....	.....
Fishkill	58.93	1.67	8	31	50	1	26	.....	.....
Low Point	62.52	3.59	8	34	55	3	05	.....	.....
New Hamburg	65.11	2.59	8	37	09	2	14	.....	.....
Camelot	69.60	4.49	8	41	05	3	56	.....	.....
Poughkeepsie	73.48	3.88	8	44	45	3	40	.....	.....
Hyde Park	79.25	5 77	8	50	32	5	47	.....	.....
Staatsburg	83.70	4.45	8	55	15	4	43	.....	.....
Rhinecliff	89.08	5.38	8	59	55	4	40	.....	.....
Barrytown	94.69	5.61	9	04	40	4	45	.....	.....
Tivoli	99.01	4.42	9	08	18	3	38	.....	.....
Germantown	104.56	5.55	9	13	..	4	42	.....	.....
Linlithgo	108.30	3.74	9	16	20	3	20	.....	.....
Katskill	110.17	1.87	9	18	35	2	15	.....	.....
Hudson	114.45	4.28	9	22	48	4	13	.....	.....
Stockport	118.70	4.25	9	27	12	4	24	.....	.....
Coxsackie	121.89	3.19	9	30	..	2	48	.....	.....
Stuyvesant	124.27	2.38	9	32	06	2	06	.....	.....
Schodack	130.37	6.10	9	37	40	5	34	.....	.....
Castleton	134.29	3.92	9	41	26	3	46	.....	.....
East Albany	142.39	8.10	9	49	10	7	44	.....	.....
Albany, arrive	142.88	.49	9	50	15	1	05	140	15
Albany, leave	.....	....	9	53	50	..	..	.....	.....
West Albany	3.12	3.12	9	59	28	5	58	.....	.....
Kamer	8.22	5.10	10	05	38	6	10	.....	.....
Athens Jun	13.66	5.44	10	11	16	5	38	.....	.....
Schenectady	17.00	3.34	10	14	40	3	24	.....	.....
Hoffmans	26.26	9.26	10	24	33	9	53	.....	.....
Cranes	29.60	3.34	10	27	35	3	02	.....	.....
Amsterdam	32.84	3.24	10	30	37	3	02	.....	.....
Akin	35.89	3.05	10	33	26	2	49	.....	.....
Tribe Hill	38.49	2.60	10	35	51	2	25	.....	.....
Fonda	43.45	4 96	10	40	27	4	36	.....	.....
Yosts	48.69	5.24	10	45	10	4	43	.....	.....
Sprakers	51.99	3.30	10	48	05	2	55	.....	
Palatine Bridge	54.91	2.92	10	50	49	2	44	.....	.....
Fort Plain	58.06	3.15	10	54	38	3	49	.....	.....
St. Johnsville	63.71	5.65	11	00	13	5	35	.....	.....
East Creek	66.99	3.28	11	03	04	2	51	.....	.....
Little Falls	73.54	6.55	11	09	06	6	02	.....	.....
Herkimer	80.65	6.11	11	15	58	6	52	.....	.....
Ilion	83.13	2.48	11	18	13	2	15	.....	.....
Frankfort	85.25	2.12	11	20	06	1	53	.....	.....
Utica	94.67	9.42	11	28	56	8	50	.....	.....
Whitesboro	98.56	3.89	11	33	39	4	13	.....	.....
Oriskany	101.58	3.02	11	36	02	2	53	.....	.....
Rome	109.11	7.53	11	43	42	7	40	.....	.....
Greens	113.32	4.21	11	47	58	4	16	.....	.....
Verona	117.43	4.11	11	51	52	3	54	.....	.....
Oneida	121.79	4.36	11	55	45	3	53	.....	.....
Wampsville	124.69	2.90	11	58	23	2	38	.....	.....
Canastota	127.02	2.33	12	00	25	2	02	.....	.....
Canasdraga	130.83	3.81	12	03	44	3	19	.....	.....
Chittenango	133.16	2.33	12	05	45	2	01	.....	.....
Kirkville	137.24	4.08	12	09	19	3	34	.....	.....
Manlius	139.75	2.51	12	11	33	2	14	.....	.....
De Witt	143.16	3.41	12	14	34	3	01	.....	.....
Syracuse, arr	147.84	4.68	12	20	28	5	54	146	18
Syracuse, leave	.....	....	12	22	41	..	..	.....	.....
Belle Isle	5.63	5.63	11	29	51	7	10	.....	.....
Warners	9.26	3.63	12	33	14	3	23	.....	.....
Memphis	11.82	2.56	12	35	32	2	18	.....	.....
Jordan	16.57	5.15	12	40	10	4	38	.....	.....
Weedsport	21.32	4.35	12	44	01	3	51	.....	.....
Port Byron	24.71	3.39	12	47	06	3	05	.....	.....
Savannah	31.76	7.05	12	53	27	6	21	.....	.....
Clyde	37.82	6.06	12	58	59	5	32	.....	.....
Lyons	44.89	7.07	1	05	40	6	41	.....	.....
Newark	51.38	5.49	1	10	59	5	19	.....	.....
Palmyra	57 82	7 44	1	17	56	6	57	.....	.....
Walworth	61.18	3.36	1	21	09	3	13	.....	.....
Fairpoint, arr	70.43	9.25	1	30	30	9	21	.....	.....
Fairpoint, leave	.....	....	1	38	20	..	..	.....	.....
Penfield	73.07	2.64	1	42	22	4	02	.....	.....
Brighton	77.04	3.97	1	46	15	3	53	.....	.....
East Rochester	78.26	1.22	1	47	29	1	14	.....	.....
Rochester	80.38	2.12	1	49	44	2	15	.....	.....
Coldwater	87 24	6.86	1	57	30	7	46	.....	.....
Chili	90.96	3.72	2	00	53	3	23	.....	.....
Chili Jun	92.13	1.15	2	01	56	1	03	.....	.....
Churchville	95.20	3.07	2	04	45	2	49	.....	.....
Bergen	98.32	3.12	2	07	42	2	57	.....	.....
W. Bergen	106.67	3.35	2	11	09	3	27	.....	.....
Byron	105.17	3.50	2	14	33	3	24	.....	.....
Batavia	112.72	7.55	2	22	30	7	57	.....	.....
W. Batavia	118.72	6.00	2	28	17	5	47	.....	.....
Corfu	124.09	5.37	2	32	58	4	41	.....	.....
Crittenden	128.45	4.36	2	36	48	3	50	.....	.....
Wende	131.44	2.99	2	39	35	2	47	.....	.....
Looneyville	133.24	1.80	2	41	40	2	05	.....	.....
Gainesville	138.13	4.89	2	46	..	4	20	.....	.....
Forks	142.35	4.42	2	49	24	3	24	.....	.....
E. Buffalo	145.54	3.19	2	51	54	2	30	.....	.....
William Street	146.68	1 12	2	54	30	2	36	.....	.....
Buffalo	148.80	2.12	2	58	05	3	35	147	34

Notes of Travel.

THE BIG FOUR'S ROLLING STOCK.

The Cleveland, Cincinnati, Chicago & St. Louis Railway owns something like 550 locomotives and 20,000 cars, and they are noted for having the greatest diversity of rolling stock of any railroad in the country. This undesirable condition of affairs has been brought about in various ways, principally by the inheritance from the purchase of small roads. This road, which has four big arms and several small ones extending over Ohio, Indiana and Illinois, is made up out of seven lines that were originally independent companies. It also has thirteen leased lines, besides operating three others. It is, then, not surprising that a multitude of different kinds of locomotives and cars find their way to the Brightwood shops, near Indianapolis, the mechanical headquarters of the system. The company has a great many locomotives and cars that would pay better as scrap than in any other way. The road has, however, a great many good cars and engines, but in looking over the different types it is difficult to see how they can be reduced to a few standards that could be repaired by interchanging material. This road is a very good example of the expensive results that accrue from managers and superintendents purchasing machinery without taking counsel with the superintendent of motive power. In the purchase of the more modern rolling stock little attention was bestowed upon what was already on the road. When an order was to be placed the lowest bidder was likely to get it, without being required to make the leading parts interchangeable with those in use. In fact, it is not many months since a callow manager ordered a large number of flat cars without saying a word to the superintendent of motive power about it. This is a very foolish and stupid way of doing business, for duplicates of cars in use could have been bought for the price paid for an odd type that calls for an entire new set of patterns. Silly actions of this kind have to be paid for very dearly in the increased expense of repairs.

CAR WORK IN BRIGHTWOOD SHOPS.

The shops at Brightwood are fairly good, those for locomotive and car repairs being all grouped together. In both departments repairs alone are strictly adhered to, and no superfluities are put on by Mr. H. O. Jackson, the master mechanic in charge. The engines and cars are repaired on the plan that gets as many as possible through the shop every month, polish and fine finish being postponed to a more leisurely season. They have a planing mill which is notably well run, and which contains many convenient appliances for facilitating work. There is a very convenient and ingenious apparatus for sharpening, setting and brazing band saws. Two wheels revolving horizontally carry the saw and hold it in the proper position for filing, and an automatic setting device gives the teeth the proper set. If the saw is broken, it is held in this apparatus and brazed with the result that the saw comes out perfectly true. A railing that they have round their band saws is also a good thing, as it supports the wood to be sawed, keeping it level with the saw table. Among the new tools lately put into the planing mill are a Greenleaf mortising machine, which they are very proud of, and a Fay bit grinder. The latter tool is said to grind a bit in one-tenth of the time that it takes a grindstone, and to do the work much more accurately. Those who have used tools sharpened on the bit grinder have no more use for the grindstone for that purpose.

The passenger cars belonging to this system are braced in the ends in the same way as the Michigan Central cars, giving them great resisting power. The mechanical department of this road, recognizing the weakness of the draft rigging in the ordinary passenger car, are making an improvement by putting in spring draft rigging, with wrought iron plates, like the attachments used in good freight cars. They are removing all 42-inch wheels from the cars, and substituting wheels of 36 inches diameter.

LOCOMOTIVE SHOPS.

In the locomotive shops they are turning out 12 engines a month, most of the repairs being heavy. This is good work for the number of men employed, and the odd kind of engines to be repaired. Here, as in nearly all Western shops, complaints are heard of the big extra expense caused by the action of hard feed water. The scale formed on the flues, which I examined, was not so thick as I have seen it in some places, but it was so tenacious that the flues have to be rattled in water to remove the scale. They use a rattler about five feet in diameter, with angle irons rivetted on the inside plates to carry the flues round and make them drop instead of merely rolling round. This constant dropping of the flue soon starts off the toughest quality of scale.

An odd practice followed here is the buying from an outside concern all brass castings of every description. All old alloys are sold to the concern supplying the castings. The officers belonging to the shop are satisfied with the plan and say that there is no delay waiting for castings, although they have to come from Milwaukee.

CHEAP PAINTING AND FUNERAL LOCOMOTIVES.

They are painting their freight engines at a total expense of seven dollars. The engines are not conspicuous as shiners when they emerge from the shop newly painted. In fact their appearance reminded me of a story told by Mr William Buchanan. He was the pioneer of soft coal burning in locomotive fire-boxes, and his efforts to abandon the use of wood were not successful till after many persistent trials. One time he had been out with a locomotive fitted up to burn coal and she was not steaming well. They had dragged along slowly for a long time, and nothing that they could do would make her steam more freely. They were all feeling sad. All at once the engineer's face brightened and turning to Mr. Buchanan, he said: "Say, Boss, I know what this engine would be good for, she would be a dandy for a funeral." The big four freight engines might be rather fast for a funeral but their appearance would harmonize with the rest of the procession.

Among the miscellaneous notes made of the shop practice are: Fish bellied side rods are used, and they consider them safer than I-beam rods. They put a brass liner on the inside of all engine wheel hubs, and find the practice a complete preventative of lateral wear. Considerable trouble had been experienced with eccentric straps breaking, and they began using a babbit lining which proved an effectual remedy. They bore out driving boxes on wheel boring press. Two good new tools have lately been put in the machine shop, a Niles boring mill and a Pond lathe for small wheels.

BOSTON AND ALBANY CAR SHOPS.

It is something of a jump from Indianapolis to Allston, Mass., but perseverance and express trains make even that leap through space a small effort. The car shops at Allston, where the genial veteran of car building interests, Mr. F. D. Adams, presides, is a very pleasant place to visit. As the wayfarer steps from the train he is struck with the attractive surroundings of the shops. Buildings adorned with ivy and other clinging plants, bright flowers blooming on parterres that cover the vacant nooks (which elsewhere would be laden with fragments of oilboxes, disabled drawbars and other favored scrap), clean kept walks and a general air of neatness give the visitor his first impressions. Once inside he soon realizes that orderly and ornate surroundings do not imply sleepiness nor want of activity in the shops. These are the principal car shops of the Boston & Albany Railroad, and there is a good deal of work to be done in them, for although the company operates only some 500 miles of road, the business calls for the use of 420 passenger train cars and about 6,500 freight cars. It is difficult to convey by means of ordinary figures an idea of an immense volume of business, but railroad men will understand that there is a good deal of work necessary to maintain in good running order the cars that carry over nine millions of passengers annually. If 50 persons were put in each car this would give 500 carloads of passengers every day of the year. The 3,000,000 tons of freight moved would load 200,000 cars with 15 tons each. All this represents work for the car department.

THE PLANING MILL.

The shops are remarkably well arranged for doing work to the best advantage with the exception of the planing mill, which has already met the inevitable and fallen behind the capacity of the other shops. This I find nearly everywhere. A planing mill will be equipped for the present business and in a very few years it is away behind the needs of the place, and it is a little harder to get additional tools for a planing mill than for any other place that requires railroad machinery. Woodworking machines are run at such a high speed that they wear out rapidly, but it is almost impossible to convince those who have the ordering of new machinery, that an old woodworking machine has outworn its usefulness.

Mr. Adams is building some very handsome passenger cars of his standard pattern illustrated and described in the National Car and Locomotive Builder of March last. It will be remembered that a conspicuous feature of the car is an arched roof. Contrary to current opinion, cars with this style of roof are said to be easily ventilated, and the patrons of the Boston & Albany encourage the company to keep increasing the number of the arched roof cars, with reports that they are unusually free from the discomforts due to inferior means of ventilation. While examining the cars that were under construction, I was struck with the thorough attention bestowed upon details. Nothing but the best material and best workmanship will pass. The wisdom of this policy followed for years is apparent in the cars whifh have been running for 20 years, and still stand up as level as the day they left the shop. A practice not mentioned in our description of the car is the putting of a thick paper lining between the boards of the roof, under the side lining and under the floor. The effect of this is said to be the keeping of the car warmer in winter and cooler in summer. The practice is well worthy of imitation by the below-zero roads. Mr. Adams does not charge anything for this suggestion.

They are using "Lignomur" as a head lining. It is a sort of paper material used largely in artistic house decoration. As a head lining it is a great success, taking as it does a beautiful subdued finish that is highly artistic and pleasing. The outside of the roof is covered with Lee composite paint, which displays extraordinary tenacity in withstanding the action of the cinder showers that so quickly polish off ordinary paint.

In the freight car department they are confining themselves to repairs and betterments. They are putting air brakes, vertical plane couplers, and the National Hollow brakebeam on all freight cars. They use the M. C. B. standard pin for the brake gear, and have found that the increased size of the pins greatly decreases the wear, besides reducing the slack to a minimum. This company had a lot of small line cars that were old but would not wear out —a very unusual state of affairs in these days. Shippers of freight are becoming very particular about the size of the cars they will take, and the refusals of the line cars became so monotonous that they had to be abandoned. Mr. Adams has converted them into coal cars, and they make a very decent car for this purpose. A. S.

Good Wood for Passenger Cars.

In a recent Western fire it was again demonstrated in the clearest manner possible that California redwood, as a building material, comes nearest being fireproof than almost any other material of which buildings are constructed. In this instance a fire broke out in the upper part of a one story building while the wind was blowing a gale that was recorded at the United States signal station as moving at the rate of 30 miles an hour. But notwithstanding this, and the fact that it was several minutes before water got to the building, the fir laths under the plaster were burned downward nearly to the floor and whole squares of the side plastering were thus loosened and fell in before the fire had burned through the thin redwood shingle roof.

It was a most wonderful illustration of the fire-resisting qualities of redwood. Had the whole building been as combustible as the laths, nothing could have saved the city. The roof was old, and as thoroughly ready for the flames as redwood ever becomes, yet the fact remains that it resisted the the ignition, and bystanders could see a seething furnace of flames through the apertures under the eaves, while nothing but smoke issued through the roof. The peculiar manner in which redwood smothers flame, and prevents its flashing forth, is an important fact in suppressing conflagrations, as fires are communicated to neighboring buildings by means of external flames and sparks which they send up.

A wood that resist fire in this fashion ought to be an excellent material for the building of passenger cars.

Test of a Vauclain Compound Locomotive.

Through the courtesy of Mr. Allen Vail, general master mechanic of the Western New York & Pennsylvania Railroad, we have received particulars of competitive tests made on his road with a simple consolidation locomotive and a compound consolidation of the Vauclain four cylinder type. The engines were in all respects of the same dimensions, excepting those parts that have to be changed in compounding. The simple engine had cylinders 19 × 26 inches and four pairs of driving wheels connected, 50½ inches diameter. The compound had high pressure cylinder 13 inches diameter and low pressure cylinder 21 inches diameter, with 26-inch stroke. The wheels were of the same size as those of the other engine. The boilers of both engines had 1,879 square feet of heating surface, the grate area being 29 square feet. The compound carried 175 pounds boiler pressure and the simple engine 160 pounds. The compound weighed about 6,000 pounds more than the simple engine.

A variety of tests were made during three round trips with the compound and two trips with the simple engine. Indicator diagrams were taken at two minute intervals, a high grade pyrometer was used to show the smokebox temperature, and a vacuum gauge was employed to ascertain the intensity of the draught. The quantity of coal used was ascertained by weighing, and the water consumption was measured by a float index. The speed of the two engines during the runs did not vary sufficiently to affect the fuel consumption to a perceptible extent. On the southbound trips the average load of the simple engine was 890,700 pounds, and during the return journeys the average load of the same engine 2,639,966 pounds. On the southbound trips the load of the compound averaged 1,059,041 pounds, and returning it averaged 2,787,377 pounds. The simple engine used 28,800 pounds of coal and 181,790 pounds of water in two round trips, and the compound used 30,010 pounds of coal and 230,850 pounds of water during three round trips. This makes an average of 14,400 pounds of coal and 90,895 pounds of water per round trip for the simple engine, and 10,003 pounds of coal and 76,950 pounds of water for the single round trip of the compound. Calculating on this basis the compound locomotive did the work with 30 per cent. less fuel and 16 per cent. less water than the simple engine, while pulling a train that was about two loaded cars, carrying 60,000 pounds. heavier than the train moved by the other engine. The average smokebox temperature of the standard engine was 689 degrees and that of the compound 630 degrees.

A correspondent of the New York *Tribune* writing from Switzerland says that the railroads in that country are not equipped with the block system of signals, and that the absence of this safeguard to railroad operating causes considerable nervousness among American tourists. If an American ever traveled on a railroad in his own country entirely protected by a block system we would like to hear about it.

All the railroads in Canada that are under control of the Dominion government are putting air brakes on all their freight cars. The officers in charge are anxious to apply the quick-acting brake to all passenger cars.

Master Car Painters' Convention.

The Master Car and Locomotive Painters' Association held their 22d annual meeting at the Arlington Hotel, in Washington, D. C., on Sept. 9, 10 and 11. The meeting was called to order at 10:30 o'clock by the president, Joseph Murphy, who welcomed the members with appropriate remarks, stating that all ought to feel proud of the association, as we had brought order out of chaos and have reduced the time required to paint a car without detracting one iota from the durability of the work.

The secretary called the roll of members, when 62 were found to be present.

The annual report of the secretary was read and showed the association to be in a flourishing condition.

ELECTION OF OFFICERS.

The election of officers was next in order, when the following were chosen by ballot for the ensuing year: President Jas. A. Gohen, Chesapeake & Ohio, Huntington, W. Va.; First Vice-President, Wm. O. Quest, Pittsburgh & Lake Erie, Pittsburgh, Pa.; Second Vice-President, W. J. Orr, Buffalo, Rochester & Pittsburgh, Rochester, N. Y.; Secretary and Treasurer, Robt. McKeon, New York, Pennsylvania & Ohio, Kent, O. (elected for the eighteenth year).

President-elect Jas. A. Gohen, on taking the chair, warmly thanked the members for the honor they had conferred upon him. Continuing, he said: "We are being recognized more every year by the railway managers, and I wish to say that if we persevere and the members do their duty there will be no doubt of the future. Your advisory committee have given you a fine list of subjects, and the Master Car Painters are the only ones to battle with the questions to which we have been assigned. I wish to thank you for the honor you have conferred upon me, but don't think that one man alone can run this convention; it depends upon you more than upon me to make it what it should be. If you have come here merely as lookers on, and with no intention of taking an active part, it were better for you and your companies that you had not come. Every one must take an active part in the discussion of these subjects."

IS THERE PURE SOAP.

The first subject discussed was, "Is there a chemically pure soap that can be safely used for the purpose of cleaning the outside varnished surface of the railway passenger coach while in service, stating soap, results and method of cleaning, Wm. O. Quest read a paper, followed by Thos. Bryne. The secretary also read a paper from J. H. Speer, who was unable to be present. In all the papers the free use of soap was condemned as being injurious to the varnish, and other methods of cleaning were advocated. All soaps had a certain amount of alkali in them, and unless used with great care were ruinous in their application. The subject was considered one of the most important on the list, and the members all took more than usual interest in giving their views and the method of cleaning which they followed. Mr. Brown said he knew of a simple material that would clean and not injure, and exhibited a piece of shellacked panel that had been standing in this cleaner for four days, and had not left a mark on it. It is simply kerosene I use. It does not retain any of its greasy properties, it will evaporate of itself, and will not for many gummy substance while in service; it softens the dirt. I have not been using it generally, but am convinced it would be practical where the car is very dirty. I use No. 0 pumice stone with the kerosene, and I have made up my mind it is just the thing we want.

METHODS OF CLEANING.

Mr. Wood feared the crawling of varnish on this surface, but a little turps wiped over it would remedy this trouble. Mr. Winters had a way of cleaning. He uses golden mineral oil and has done so for several years. One pound of No. 00 pumice stone to one pint of naphtha and add one gallon of the oil, he can put this on and let the car run a week without injury, then wash it off clean for revarnishing; had cars out over a year and when cleaned in this way it brought back the luster as good as when first turned out.

Mr. Bishop said this was not new. He had used it to some extent, but not generally, as he did not know the exact formula; but the next time we meet you will hear more from me on this question. Two hours were spent in the discussion of the subject and a large amount of information was obtained from the different methods employed.

CAN A NEW LOCOMOTIVE RECEIVE A DURABLE FINISH.

The next subject discussed was, According to the practical experience and ideas of Railway Car and Locomotive Painters, can a new locomotive receive a durable finish in 10 days, stating method and materials used? Mr. Moriarty and Mr. Coleman read papers on the question. Mr. Moriarty said there were two essential features in a good job, time and good material. Some of us have the time, but not the material. In some shops the painter was expected to make up for time lost by the machinist. Rapid methods of painting could not be relied on. He had seen engines painted in 10 days that turned out to be durable, but thought it was good luck, also knew of jobs that had all the time desired by the painter and everything favorable, but they did not give good results as to durability.

Mr. Coleman, of the Intercolonial Ry., said in his paper that an engine could not be painted in 10 days. More time is necessary. He uses no lead on engines, but iron ore mixed with raw oil, then fills up with English filling, applies his color and gives two coats of wearing varnish.

Mr. McCullum, of the Pennsylvania Road, said they had two plans of painting an engine—a 5-day and a 10-day. The 10-day was considered durable, the 5-day was something else, but they had to get them out sometimes in that short time. They did not call an engine durable that did not run 18 months before coming in for repairs and painting.

The president had seen an engine painted in three days and it was durable, but it had simply two coats of metallic oil paint and lettered with oil color.

Mr. Putz, of the Wisconsin Central, stated that on roads that have many tunnels the durability is less; he finished some engines in 10 days but preferred 15.

Mr. Mason of the Pennsylvania road. We paint engines frequently that don't keep in good condition more than four or five months from some local cause. I don't think that is due to the system of painting. We turn out from 50 to 60 engines a month. I use acid and water to neutralize the rust on a tank where it has accumulated in the yard. We don't consider an engine durable that will not run 18 months.

A motion was made and passed that it is the sense of this convention that when an engine is painted in 10 days and comes in and is cleaned and revarnished it should give two years' service.

CAR CLEANING.

Mr. Lowry, of the Chicago, Burlington & Northern Road at La Crosse, Wis., presented an essay on "Car Cleaning," which was read by the secretary. No discussion was allowed on this paper as it fully agreed with the methods of cleaning which was previously discussed. Oxalic acid was the principal incredient that Mr. Lowry used, and with satisfactory results.

The next subject on the list was, As an associate body can we exert an influence on purchasing power that would remedy where necessary the quality of materials furnished? An item of great importance when viewed from the standpoint that the best procurable is the most economical, as demonstrated by practical experience in the railway paint shop.

James A. Gohen, Robt. McKeon and A. T. Schroeder presented lengthy papers on the subject which went to show the difficulties we labor under by having poor stock and tools in the car paint shop. They advocate a closer acquaintance with the purchasing power, and frequent council as the remedy which would insure great benefit to the railway companies.

PAINTING HEAD LINING.

The next subject was, How should the new wood head lining material of a passenger coach be treated to prevent the finished surface from becoming destroyed from decay of filler grain, raising, etc., due to the interior heat and moisture of a passenger coach?

Jno. T. McCracken, of the Jackson & Sharp Company, presented a paper, followed by one from Mr. Webb, of the Laconia Car Company, also a paper by Alex. Campbell, of the Manhattan Elevated Road, New York. The methods of the three gentlemen differed only in that some were using terra alba filler and the others corn starch; a general discussion followed. Mr. Putz used corn starch, which he considered equal to terra alba used by Mr. McCracken, if this is mixed properly, I use in mixing one part raw oil, one part Japan filler and one part gold size, and reduce with turps. Japan gold size is better than the gold size; it dries not so rapidly, but it wears better, no matter what material you use. If it is not well protected with varnish it will not stand atmospheric influences, will draw the material out of the grain of the wood, and I think too much shellac is used on this class of work. I simply give a very thin coat of shellac and two coats of finishing varnish, and our linings stand well indeed.

Mr. Bigelow: We have cars built at Pullman, but the linings soon give out, especially over the lamps and around the stoves, and after two years' service they have to be scraped off and finished over.

The President: I have the pleasure of taking care of linings only as Mr. Brown has, but they don't last, but I think terra alba is a better filler than corn starch; we have cars on our road where the new head linings in them did not run over a year before they had to be scraped, but I lay this to the lack of varnish which was put on when put up.

Mr. Quest: There is an affinity between glue and corn starch. That is where the trouble is. I destroy that by coating the raw lining with oil. I may differ with some of you, but that is the foundation, and I also back up the lining with two coats of metallic paint.

Mr. Stout: I have tried the oil, but I believe one-third oil, one-third turps and one-third gold size will do better.

Mr. Schellar: I used corn starch on linings. I am the father of it, but I became convinced it was not the best.

ROUGH STUFF OUTSIDE OF PASSENGER CARS.

The next question was, as a question of economy and durability should rough stuff be discarded on the outside of surface of a railway passenger coach, if so what materials and methods of applicatien will best answer the requirements of this class of work, durability being the main consideration. Mr. Bishop read a lengthy paper which was in favor of holding onto the rough stuff finish.

Mr. Schellar, of the P., W. & B. road at Wilmington, spoke at length. This is a very important subject, and I think rough stuff should be used, for it is the foundation, and it is not the cause of cracking, as some think, but the varnish is the cause. It is the varnish makers' fault. Lead rough stuff is the best. My method of painting a car is to take boiled oil, heat it to a great heat, and coat the car with the hot oil on the bare wood. Don't spare the oil; put on two gallons on a 60-foot car. The wood is thoroughly saturated. Oil penetrates deeper when it is hot than cold oil. The next morning it is all absorbed by the wood. Then I put on my priming, mixed with equal parts oil and turps. Mr. Leopold said the hot oil priming would not do in a warm climate. It would keep sweating out with the hot sun and ruin the painted surface. You cannot in our climate use oil, but must use hard drying colors to give good results. Mr. Keil uses rough stuff on panel work, but does not think it practical on beaded work. Mr. Bishop uses rough stuff on all classes of work; it is wood, just the same. Mr. McKeon abandoned rough stuff three years ago, and by the experience is satisfied the work wears equally as well without it. He gives two coats of surface filler, quite thin, then sandpaper it, and he finds the varnish holds out better on this than it does where you use rough stuff and rub with pumice stone, as you will cut the edges more or less in rubbing on panel work. He uses a scraping filler over the priming coat, but not on beaded work. Favors discarding rough stuff, both on the ground of economy and that the paint gives better service. Of course we are not aiming for a fine surface; that is unnecessary on our passenger equipments. No one notices it after it leaves the shop.

After a lengthy discussion a motion prevailed that it was the sense of the meeting that rough stuff should not be discarded on passenger cars. The matter of inspecting the interchangeable test panels, which had been painted and exposed for 10 months in different climatic sections of the country, was, for want of time to do justice to them, given into the hands of the secretary, who was required to examine and make a report after the adjournment. The list of queries was fully discussed and valuable information given.

No. 1. Would it be advisable to form a bureau of information in connection with our association? The committee on information consisting of three members had attended to this duty, but the number was increased to five, and to be known as a bureau of information.

No. 2. Do you use all or part shellac on the hard wood inside finish of your passenger cars? After a lengthy discussion the majority used shellac for foundation over the filler and finished up with varnish, but Mr. Brown was one who used all shellac with good results. It was brought out during the discussion that there was more durability in shellac than many gave it credit for, but the surface should be oiled over occasionally while in service, which some said was the secret of its durability.

No. 3. How do you prepare your stack blacking for locomotives while in service? Boiled linseed oil and lampblack, made very thin, seemed to be used by many. Put it on when the stack is warm, it wears much better. Some used plumbago and rosin reduced with naphtha put on with a piece of waste, and claimed it would outwear the stack. Dixon's graphite was used by the president, and he believed it stood more heat than anything else. Mr. Aquart used drop black thinned with turps; apply with a sponge; they stand well. Mr. Bigelow used boiled oil, lampblack and tallow with fine success. Mr. Brown used drop black, raw oil and varnish (we wondered he did not use shellac), but thinks plumbago is good. Mr. Laing used asphaltum, also Mr. Given. Mr. Moriarty used lampblack and boiled oil. Mr. Mason, raw oil and lampblack; found boiled oil unsatisfactory.

No. 4. What materials do you use, and how long do you take to paint your freight cars? A majority of the members were using Prince's metallic and boiled oil, and the time required to paint a car three days, although in good weather it could be done in two days by second coating and stenciling on the second day.

No. 5. As an item of shop economy in what manner do you keep your paint stock and brushes in the most serviceable state? The discussion on this was general, and most shops had a stockroom with a man in charge who took care of all stock, giving it out only on the order of the foreman or the man in charge of the gang; each man had checks which represented the different class or sizes of brushes, and when a brush was given out a check was left in its place; some shops allowed the coaters, varnishers and stripers their own tools, with a cupboard to keep them in. It was the sense of the meeting that no matter how small the shop, there should be a stockroom furnished for the proper care of stock and tools.

No. 6. What is the best formula for preparing floor paint for passenger cars? Some did not paint floors, others gave them shellac over the color, which in many shops was a standard paint adopted by the road. Shellac hardens the surface, and will outwear varnish; they all look well when run out, but don't last long.

No. 7. What are your views concerning piecework for the railway paint shop? The general opinion was, it is what all must come to; it was giving the best of satisfaction in all shops where it was tried, and a large number of members were running their shop on that plan. The companies were getting their work done for two-thirds the expense for labor that it cost them under the day and hour system. Some said it would not work in a small shop; others who had adopted it stated they would not change back if they had but two men, and in all cases the workmen were better satisfied and making better wages; so that both employer and employé were greatly benefited by the introduction of the piecework in their shops.

The discussion on the several subjects on the list having closed and the usual resolutions passed, the convention adjourned at a late hour Friday evening, to meet in Detroit, Mich., on the second Wednesday of September, 1892.

Place for Next Conventions.

The joint committee of arrangements for next onventions of the Master Car Builders' and Master Mechanics' associations consisting of Messrs. R. C. Blackall, J. W. Marden, E. Chamberlain, O. Stewart and Angus Sinclair have sent out the following notice:

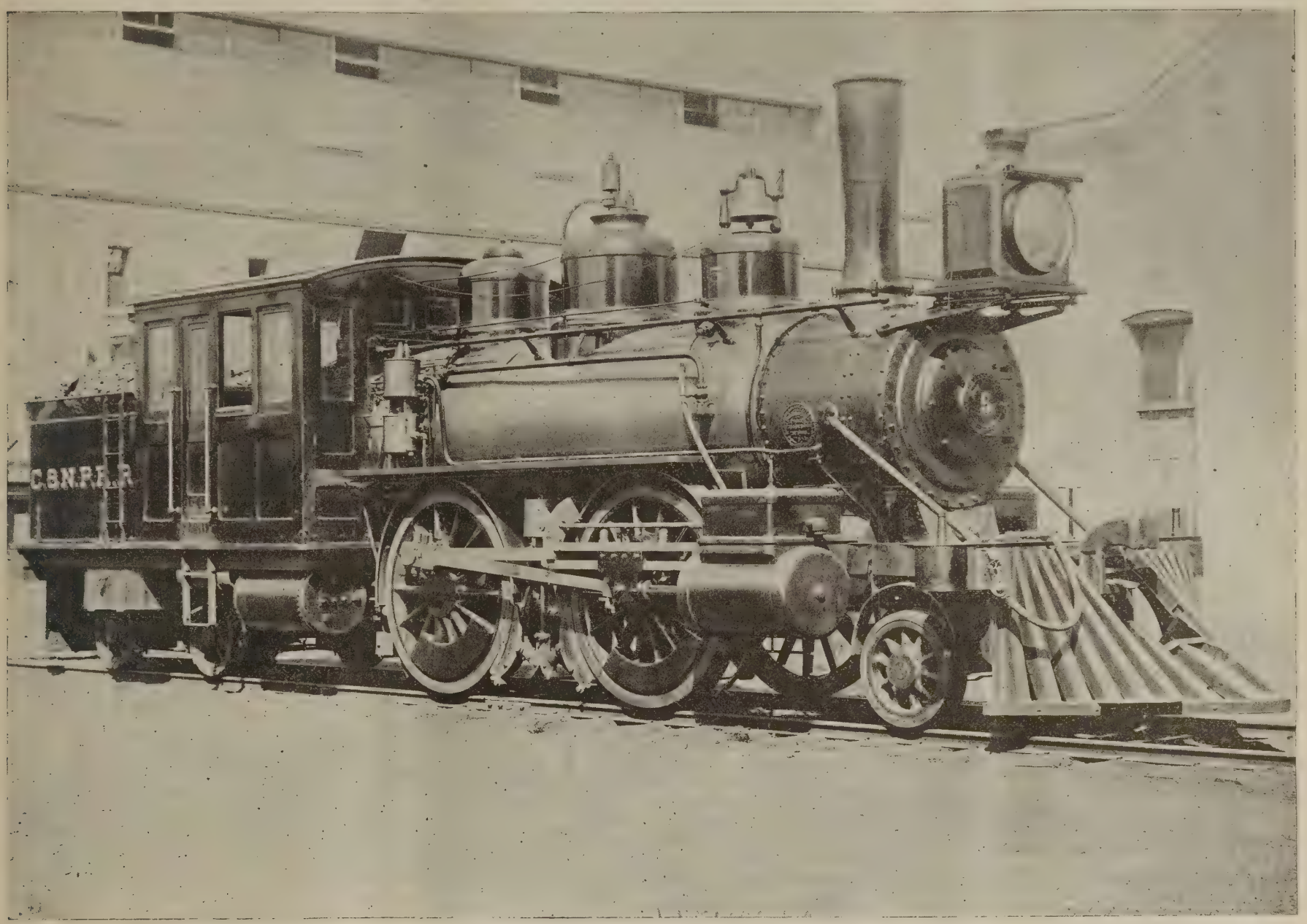
The joint committee of the above associations, empowered to select the place of meeting for the next conventions, met at Buffalo on Sept. 7, and decided on Saratoga, N. Y.

Congress Hall Hotel has been selected as the headquarters of both associations. The members and all others attending the conventions will receive accommodation at the uniform rate of $3 per day. Application for rooms should be made to H. S. Clements, Congress Hall, Saratoga, N. Y.

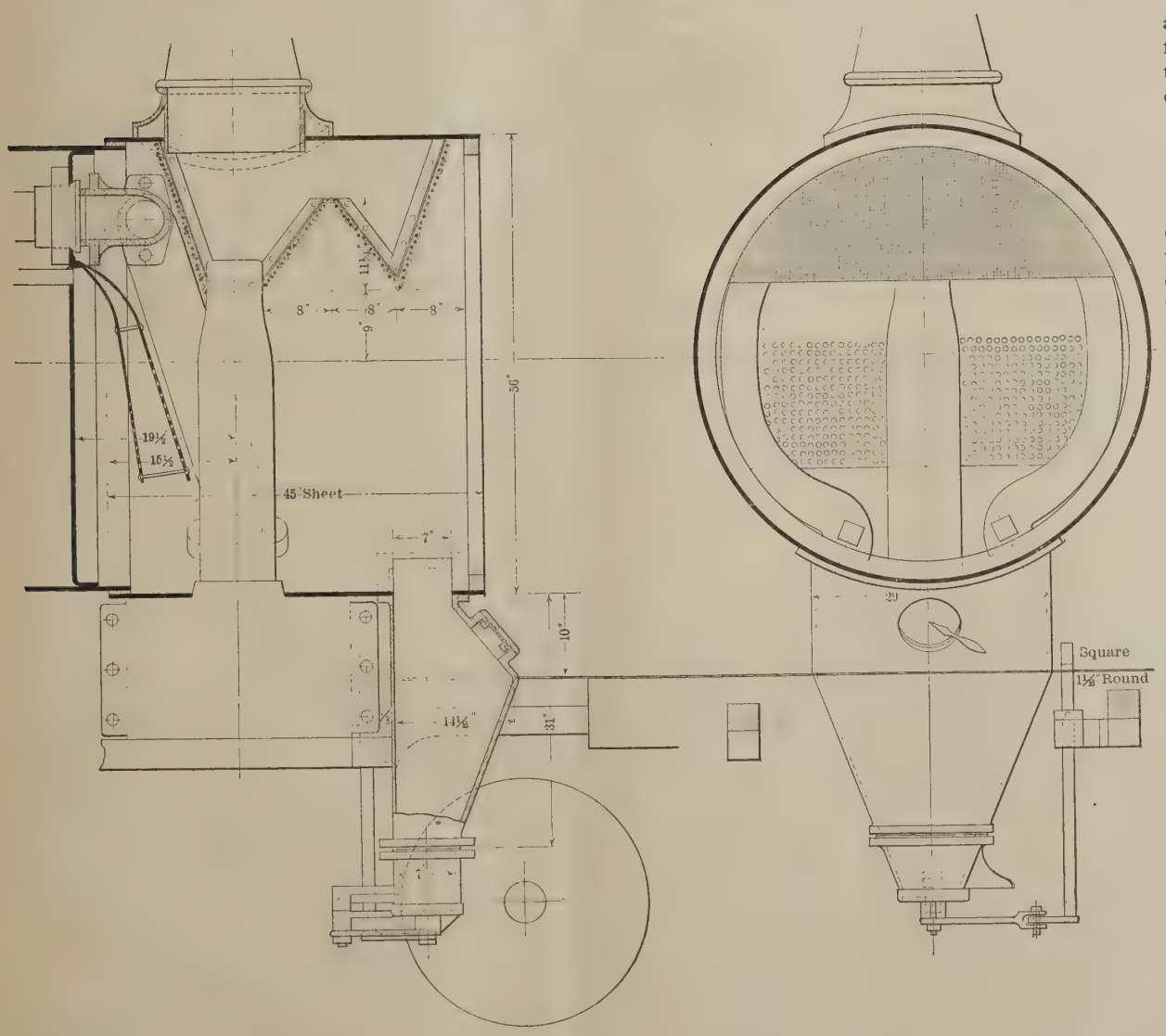
As the second Wednesday of June happens to be on the 8th next year, and as there was difficulty in getting a hotel to open so early, the executive committees of the two associations decided to postpone the conventions one week. Under this arrangement the Master Car Builders' Convention will meet on Wednesday, June 15, and the Master Mechanics' Convention on the Monday following.

Bell's Spark Arrester.

The annexed engravings illustrate an improved form of spark arrester invented by Mr. J. Snowden Bell, which is in use on some locomotives belonging to the Wisconsin Central. The engravings give a cross-section and an end view of the invention, and also show it as it appears on a suburban locomotive belonging to the railroad company named. This form of spark arrester gives all the good features of the extension smoke-box without the extension, and consequently saves carrying the unnecessary weight. It gives the benefit of an open stack, a deflecting plate and a smoke-box netting with the short smoke-box, and also provides ample space for holding the sparks, this being a reservoir placed under the smoke-box proper. The netting is formed in four planes set at different angles, an arrangement that secures all the area of netting desired. The diaphragm is formed of double perforated plates, the openings not coinciding. In the Wisconsin Central engines, a small removable bonnet is placed in the section of netting immediately in front of the exhaust pipe and gives easy access to the nozzle. The whole of the attachments that form this kind of spark arrester are designed with a view to efficiency and convenience, and those in charge of the engines report that the device works very satisfactorily.



BELL'S SPARK ARRESTER ON LOCOMOTIVE.



Still Another 100-Miles-an-Hour Locomotive.

The woods appear to be getting full of locomotives that can run 100 miles an hour. The trouble with them all appears to be that the speed is all in the form of abstract calculations as to what can be done. We wish some of them would do it and convince a skeptical world which persists in believing that no locomotive has yet been built that will run 100 miles an hour except down a mountain side. Here is the latest candidate for high speed, as reported by a Kansas City paper :

"Kansas City will soon have the honor of having the fastest locomotive ever built credited to this city. Joseph Cookson, the inventor of the Lewis engine, which will run 100 miles an hour, has about perfected arrangements to have the engine built at the Santa Fe shops at Topeka, and the first trip will be made over that enterprising road. Mr. Cookson has been in communication with the Santa Fe officials for some time, and arrangements have been perfected for the building of the engine.

"The first engine equipped with the Cookson or Lewis valve, as it is known, will be a standard size locomotive and will be built from the model now on exhibition at the Grand Junction ticket office. Mr. Cookson will take the model to Topeka next Monday or Tuesday for the purpose of exhibiting it to General Manager Robinson. It is understood that the mechanical department of the Santa Fe is well pleased with the new idea, and is convinced that the valve as applied will be a great success."

The Independent Order of Railway Conductors of New Haven, Conn., are preparing to hold an exhibition of railway appliances in New Haven. The promoters of the enterprise are anxious to secure the loan of any railroad device that would be of historical or curious interest. Any one willing to loan articles for exhibition should address the manager, Room 1, 63 Church Street, New Haven. This Order professes to make efforts to harmonize labor and capital. Their leading motto is "no strikes."

Committees of Master Car Builders' Association.

The Executive Committee has arranged the following subjects, and committees to report upon them in June, 1892:

"Joint Inspection."—To prepare a supplementary set of interpretations and illustrations of the Rules of Interchange. *Committee:* A. M. Waitt, H. C. McCarty, F. D. Adams, Wm. Garstang, Joseph Townsend, J. T. Chamberlain, D. W. Hunter.

"Air brake and Signal Instructions."—To review the instructions proposed at last convention. *Committee:* E. W. Grieves, R. D. Wade, J. L. Greatsinger.

"Cast Iron Wheels."—To investigate what improvements are being made in the manufacture of wheels, so as to secure greater uniformity in quality, in depth of chill, and in distribution of metal for proper balance. *Committee:* George W. West, W. H. Thomas, John Player.

"Freight Car Truck Frames."—The report upon the relative advantages of swinging and rigid bolsters, and upon the Fox pressed steel truck as compared with the prevalent forms of freight car trucks. *Committee*: G. F. Wilson, W. S. Morris, W. F. Turreff.

"M. C. B. Automatic Couplar Standards and Limits."—To consider the standard measurements, and whether any additional or other measurements are desirable as standard, and to report upon proper limits of variation to be allowed from standard measurements. *Committee*: J. S. Lentz, C. A. Schroyer, J. M. Wallis.

"Steam Heating and Ventilation of Passenger Equipment Cars."—To report upon the general progress and the efficiency of different systems, and to present drawings for a proposed standard location of ends of train pipe, and a proposed standard connection in detail for a union between the hose and pipe, so that one style of coupling may be readily removed and another substituted in its place. *Committee*: J. N. Barr, J. C. Barber, W. H. Lewis, T. A. Bissell, J. W. Marden.

"Steel Tired Car Wheels."—To report upon relative merits of solid cast and wrought centers, and of plate center bolted to hubs and tires. *Committee:* R. E. Marshall, J. O. Pattee, C. H. Cory.

"Wheel Guarantee."—To consider the communication from the Wheel Manufacturers' Association, read at last convention, and to report with recommendations. *Committee:* J. J. Hennessey, Thomas Sutherland.

"Steel Plate and Malleable Iron in Car Construction."—To recommend a standard for stake pockets, and a method in detail for attaching to cars. Also to recommend standards for center plates, in detail, showing one for iron transoms and one for wooden transoms. Drawings and models to accompany the report. *Committee:* Wm. Forsyth, John Mackenzie, E. D. Bronner.

"Standards of the Association."—To consider the standards already adopted by the association, and recommend what measures are expedient to secure their general adoption and use. *Committee:* R. H. Soule, E. Chamberlain, Wm. McWood.

Metal for Brake Shoes.—*Committee:* G. W. Rhodes, E. B. Wall, Geo. Gibbs.

Cold Truth About Railroad Managers and the Motive Power Departments.

A well-know railroad man who has recently been appointed general manager of a busy road, sends us the following letter, which came into his possession with the other archives of his office. He says: "The former general manager has retired to private life, the M. M. is still here, got what he wanted, and deserved it all. The letter is too good to keep." The man who wrote this letter is well known to the readers of this paper:

G. P. X.——, Gen'l Manager X. X. & X.

Dear Sir: Some days ago you sent your messenger boy to me with a note, asking what it would cost to grade and put in four new tracks in the repair yard that I had asked for, and requesting a reply by bearer. I told you that I did not know, but could find out if you had any aversion to referring the matter to the road master's department, and now have before me your sarcastic, ridiculous and amusing "roast.'

You seem to think that the head of the mechanical department should be an encyclopedia of railroad information, and know everything for your special benefit—for two thousand a year.

I have on file in this office more than one hundred letters and notes from you, asking all kinds of questions on all kinds of subjects, to every one of which I have made some reply; I have gone with you to inspect bridges and buildings, helped formulate time tables, select petty officials, and, through your orders, interfered with the purchasing, track, bridge, and storekeepers' department, until I am sick of it.

You have sought and received my honest advice about every subject coming to your attention, so far as I can learn, except the single one of rates (and God knows that's in the worst muddle of them all).

You expect me to pull ten coaches, forty miles per hour, with a 17-inch engine. To keep more than one hundred engines and four thousand cars in repair with a handful of men—and make all my own material out of scrap.

I do not know how much it would cost to put in those tracks, nor how long it will take; neither do I know how long it took the Lord Almighty to make this country.

I pretend to know something about my own department, however, and wish to go on record as having called your attention to the following facts, to wit:

I need 20 extra men, mechanics, to keep up running repairs and get power in shape for fall rush, and I need them now—if we don't get them we cannot handle business of last year, and you say this year will be heavier.

We have 12 16-inch engines that are unsafe to run—they need new boilers. I advise their sale as scrap, and the purchase of eight consolidation engines with 19 or 20-inch cylinders—we are short of power. We need a new wheel lathe—been asked for in every requisition for three years—costs money to send wheels away for tire work.

I want permission to raise the pay of engineers on freight half a cent a mile, and firemen one-quarter of a cent—they earn it, and it will prevent a strike. I want to be relieved as general adviser and non-commissioned *factotum* to the general manager, and left time and opportunity to attend to the thousand duties of the M. P. department.

I want my title changed to Supt. M. P. and R. S., and credit given me for what I do, and nothing for what I do not do.

I want the roundhouse roof painted, a carpet for my office, the gas pipe fixed, and the flue rattler buried so that I can think, and then I want the pay of a Supt. of M. P.—say $5,000 per year—I throw in all other service already rendered. If you think this is too much to ask at once, please look into your letter file and see how far most of the requests reach back, and average them.

Honestly, don't you think you have been unreasonable with myself and my department? Haven't you expected, asked and received too much? Sleep on it, and if you don't agree with me in each and every particular—especially the $5,000—please accept my resignation, to take effect at once.

Seriously yours,

[And there are many more who need to take the same kind of a stand.]—Locomotive Engineer.

Arresting Engineers Without Cause.

When any of the natives in Mexico happen to get struck by a railroad train the engineer is liable to be cast into prison, even when he is not in the least to blame for the accident. When this happens it causes intense indignation among the English speaking people, and cases have been known where the trainmen broke into the jail and released the man unjustly incarcerated. People in the country are very indignant when they learn about men being punished in Mexico without cause, and we have read very fervid articles denouncing the practice of punishing engineers unjustly. We find, however, that Mexico does not have a monopoly of the practice of imprisoning innocent persons because an accident has happened. The following item of news is clipped from a New York evening paper:

"Engineer Murphy, who runs a dummy engine on the New York Central Railroad, was arraigned before Justice McMahon in the Yorkville Police Court this morning and committed to await the action of the Coroner. Last night, at 8:20 o'clock, Policeman Johnson of the Twenty-second Precinct found the body of an unknown man, evidently a tramp, on the car track on Eleventh avenue, near Sixtieth street. He had attempted to steal a ride on the engine, had fallen off and was killed. The policeman arrested Engineer Murphy."

This accident happened with a train slowly pulled through the city streets on a dark night. Men and boys are in the habit of jumping onto the moving cars and stealing rides, and it is the duty of policemen to prevent this unlawful practice. The engineer at the front of the train has no means of knowing who climbs upon the cars, and is not expected to prevent the practice. Yet when an accident happens he is invariably arrested and sent to jail till an investigation is held. If the Engineers' Brotherhood divisions in New York City had any real interest in the welfare of their class they would combine to fight the practice of arresting engineers without cause, and make examples by prosecuting the policemen and rum-shop magistrates for false imprisonment.

Overcrowded Cars.

A carload has long been a very uncertain quantity in railroading, but it has become still more unsettled among those who travel in street cars and on suburban railroads. There are good arguments in favor of preventing street railroad companies and others from carrying more passengers than there are seats for, and there are in most European countries laws making this the limit of the carrying capacity of cars. But in this country the limit is only reached when the last person that can be squeezed into the car and on the platform and hung onto the steps is taken up. Those who make their money by imposing upon the public in this fashion pretend that it would be impossible for the companies to furnish sufficient cars to move all the people seated during the busy hours. That pretense was put forward in European cities, but when the laws or ordinances were passed calling for seats for all the passengers the companies contrived to increase the number of cars sufficiently to carry all the passengers promptly. The fashion here is to grant valuable street privileges to street railroad companies and then permit them to impose upon the public in the most outrageous fashion.

In nearly every city there are good reasons for complaint of the treatment accorded to those who have to patronize street cars, but a street railroad in Buffalo appears to deserve the first prize for cheek in dealing with the public. Manager Littell, who deserves to run in harness with Richardson, the street car tyrant of Brooklyn, is trying to enforce a rule that the inside of each car must be packed as close as people can stand before any one is permitted to occupy the platform. He believes that a ride in his cars during the busy hours gives the passengers the benefit of a free Turkish bath.

American Refrigerator Cars in Australia.

Some enterprising railroad men in Australia prevailed upon the officials in charge of the railroads there to import some Wickes refrigerator cars from America, under the impression that they would be very useful in the transportation of fruit and dairy produce in that warm climate. The enterprise does not appear to have been appreciated by those who will no doubt eventually be benefitted by the use of the cars, for we find the following attack in a Melbourne paper:

"The absurd blunder committed by the railway authorities in building costly and wholly unsuitable refrigerating cars, with a carrying capacity of 20 tons, instead of constructing light running cars, capable of carrying about four to six tons of dairy produce, was brought before the Legislative Assembly yesterday, when a return called for by Mr. Armytage was presented. As has been pointed out in these columns, the commissioners actually ordered the wagons to be built on the pattern of an American meat carrying car, used for traveling long distances in the United States, and the vehicles, as may easily be comprehended, are quite unfitted for the carriage of dairy produce, which has to be picked up in small parcels at different stations. The return shows that 31 cars have been built. The cost of each was £602 4s. 5d., exclusive of items supplied to contractors free of cost—namely, wheels and axles, channel bars, buffers, bearings and Westinghouse brake fittings, which bring the total cost up to £772 10s. 6d. The weight ranges from 17 tons 16 cwt. to 18 tons. The approximate cost of maintaining a temperature of 60, 50 and 40 degrees, respectively, inside the cars for nine hours continuously, the temperature outside being 80 degrees, when in actual constant traffic equals £7 per ton for each car per week (equal to 7s. 6½d. for nine hours), ice being supplied at 70s. per ton. Experiments have not been made with fixed internal and external temperatures, nor with the internal temperature at 40 degrees and an external temperature of 80 degrees. The name of the patent used is that known in the United States as the 'Wickes.'"

Promise of Great Speed.

"If the new engine I am about to have constructed is not capable of making 100 miles an hour, I'll give her away to the first person I meet."

This astounding statement was made yesterday by Mr. Jackson Richards, the master mechanic of the Philadelphia & Reading Railroad, who was exhibiting to a party of deeply interested persons the drawings for a locomotive which, if successful, is almost sure to revolutionize the construction of the high speed locomotives of the future. Mr. Richards, who is recognized all over the United States as having no peer in knowledge concerning locomotives and railroad machinery, has been working on his latest invention for the past ten years, and a few days ago the drawings were completed and the patent was applied for.

The new invention will enable a gigantic stride to be taken in the matter of high speed locomotives, and, if the new flyer is as successful as experts predict she will be, it is more than likely that the time between Philadelphia and New York will be made in less than an hour. A specimen engine will be built for exhibition at the World's Fair, and the trial trip will be made between here and that city.

In outward appearance the new locomotive will not differ materially from the speedy engine now used on the Philadelphia & Reading Railroad between this city and New York. The peculiarity of construction lies in the fact that instead of two cylinders, as used at present, there will be four. One cylinder will be located on each side of the locomotive frame as at present, and the other two will be cast in what is known as the cylinder saddle. The inside pair of cylinders are to be in one piece, and will lie on an angle. The outside cylinders are to be horizontal as at present. The four cylinders will entirely overcome what is known to engineers as the dead center, and the engine will be perfectly balanced without any counter-balance in the wheels. This latter improvement will, to a large degree, do away with the vicious pounding which has proven so destructive to modern roadbeds. The perfect balancing of the engine will be largely due to the working of the two cylinders so near her center, and these same cylinders, working as they do from such a central point of vantage, will help out in the matter of speed to a great degree.

According to the experts who have examined the drawings, the valve motion is perfect. There will be four valves—one to each cylinder—and they will be operated by two links, the same as now used for two cylinders.

The above story is clipped from a Philadelphia daily. We would like very much to learn the names of the experts who predict so much for the four-cylinder locomotive designed by Mr. Jackson Richards, "who is recognized all over the United States as having no peer in knowledge concerning locomotives and railroad machinery." The engine appears to be a near relation of the Shaw of unhappy memory, and will no doubt revolutionize the construction of high speed locomotives as that engine did. There are so many of these revolutionizing locomotives coming out on paper that we are surprised to find any of the old kind still pulling trains.

How Primus Gets Left.

My friend Primus is one of the most frugal master mechanics in the country and he is always trying to make a shining record for the close management of his department, but somehow he does not get there very rapidly. He sweats and fumes and tears around and tries all sorts of things to keep down expenses, but somehow neighboring roads whose master mechanics appear to have no ambition to run cheaply come out very regularly with two or three cents to the mile run below Primus. He swears that cooked mileage sheets is at the bottom of the difference, and he scorns to stoop to that method of making a record. I am sure he is not that kind of a man, but I do not believe that the other fellows display more mileage than their engines have run. They contrive to do the business at smaller cost.

Primus is partly but not entirely to blame for his neighbors getting ahead of him. The general superintendent of the road is, like Primus, ambitious to make a record for close management and the firm grip he keeps on expenditures is very costly to the company. It is the old story of all hands laboring to keep the spigot tight while the liquor is gushing from the open bung hole. You published a story some time ago about the old way of running the B. & O. road, when the principal article of faith inculcated by the management was "never throw away anything that can be used." That I know was intended as a joke, but the principle is rampant all the same on many railroads that consider themselves more progressive than the B. & O. ever was.

The business of the road Primus is on has doubled in ten years, but he is doing the work with the same tools he had before that time and they were not all modern then nor too numerous for the business. When he asks for a new tool the general superintendent rails and rages at the extravagence of people and asks poor Primus if he wants to put the road into the hands of a receiver? This interview has been repeated so often with the same result that Primus is afraid to ask for anything now and works away doing the best he can. His old one-headed wheel lathe is running all the time and is always behind, while double flanged engines are knocking spots out of the frogs. Several engine lathes and the big planer are worked overtime nearly every night, but all this extra effort fails to get the engines quickly out of the back shop. Once they get there it is a weary drag before they reach the roundhouse again. All this makes the wages account high and the general superintendent threatens monthly to clean out a few bosses to see if he can get the work done cheaper; but his bark is harder than his bite and nobody is hurt.

Another thing that indirectly increases the cost of operating is the want of means for showing how much coal each engine uses. The coal is supplied direct from the cars at most of the coaling stations and the quantity put on a tender is guessed at. When there is a shortage of the coal accounted for it is straightened out by dividing the charge among all the locomotives. The locomotives are charged with all the coal used by the company for all purposes. This way of charging coal burned in station grates, in the heating of cars and in the pumping of water to the locomotives looks to be a blind way of doing business; but those in control say that it simplifies the keeping of accounts. It also gives every man who handles coal the license to waste it with impunity. It is not surprising that the neighboring roads make four or five miles more to the ton of coal than the engines that Primus looks after.

The saving tendency of Primus in his shop management works not wisely but too well for economy to result. He is painfully imbued with the wickedness of sending to the scrap heap anything that may at some time be useful. The consequence is that every part of the establishment is loaded up with scrap waiting to be sent to the cupola and the forge, when some clear headed manager comes in and calculates the waste of years due to mistaken zeal for saving by fractions. Another mistake made by my friend that may some day weigh against him is, that he has followed the policy of keeping his engines as nearly as possible in the shape they were in when they came from the builders. He has a variety of kinds of the same general dimensions, and it would be easy to make the leading parts interchangeable, but he does not believe in making alterations that are not absolutely demanded. The consequence is that when an engine has a broken front end, a cylinder head, a crosshead, a piston or an eccentric strap, nothing can be done about getting out a new one till the engine comes in to give the opportunity of making the measurements. Then nearly every engine and tender has springs and hangers to suit itself alone, and a large stock has to be carried for ordinary repairs. All this helps to swell the expense of maintenance, and it does not require the eye of a prophet nor the son of a preacher to see why his neighbors leave Primus behind in the race for economy.

SAM SHORT.

Rough Railroads in Europe.

Mr. Chauncey M. Depew has been a great traveler in his day, and he naturally observes closely the attractive features of foreign railways. In the course of a recent address he had much to say about the discomforts of foreign railroad travel, and little in the way of commendation. He says that a serious discomfort and a source of very great annoyance on European railways is caused by the incessant jolting. This is due very largely to the small size and faulty construction of the cars. If you happen to ride in the forward "carriage" of any of the express trains of a European railway, you are thrown up and down, from side to side, with a violence which could only have been equaled in the old days of stage-coaching, when those lumbering vehicles were driven over what were called corduroy roads, which were constructed by felling trees and placing them in close juxtaposition across the highway. Charles Dickens had some experience of roads of this kind while traveling in Ohio on the occasion of his first visit to this country about 1842, and he has eloquently described in his "American Notes" the consequent sufferings of himself and Mrs. Dickens from the jolting and bumping to which they were subjected. It would require a pen as brilliant and facile as that of the great novelist to do justice to the discomfort endured by an American tourist while traveling in the forward car of an express train on a European railway.

Forging by Electricity.

In the basement of a great building in Oliver street, Boston, occupied by the Electrical Forging Company, the writer witnessed a free exhibition of forging by electricity which ought to be highly interesting to all railroad men concerned in the working of metals. This is a different process from that of welding by heat generated by the electric current, and is capable of much wider application. The process to be seen in operation at the place mentioned was invented and developed by Mr. Geo. D. Burton, inventor of the well known stock car which bears his name. It is only a short time since this system of forging was invented, yet it is already in practical operation heating the iron and steel used in a large manufacturing establishment Heating metal by the electrical current has been practiced for years in an experimental fashion, but it was always found that the heat was not uniform, which prevented useful application of the process except for welding, which was practical, through the tendency of the end of the bar to become hottest. Mr. Burton worked out the process, by which any part or the whole of a bar could be raised to a uniform heat, and electrical forging became an accomplished fact. In the establishment at Boston I saw bars of iron and steel put in the electrical apparatus, and in a few minutes raised to the forging heat, then passed under dies, rolls or other shaping devices, and passed out in the form of spikes, bolts, balls, and other finely finished articles.

The parties controlling this process claim that by using electricity as a heating medium and then subjecting the heated parts to pressure, the particles or molecules of the metal are more firmly united, thus making cutting edges susceptible to a better temper and finer finish. The claim is also made that the metal heated by electricity and forged under that heat is stronger than similar metal heated in the fire. A claim readily admitted is that it wastes little or no material, while accomplishing many things heretofore deemed impossible, and is so quick and accurate in its operation that its productive capacity is far in advance of any other process in mechanics. It saves labor, material and time, and reduces the cost of production so that it must inevitably control the manufacture of any article that can be produced by it. A. S.

Some New Equipment.

The St. Charles Car Company has just closed contract with C. B. & Q. Ry. for 30 elegant day coaches, to be delivered six per month during the first five months of 1892, cars to be 53 feet long, mahogany finish, four-wheel truck, contracted chilled wheels, Scarritt high back seats, and to be elegant in design and of Burlington standard type. This company also closed contract for building a complete train for the Centralia & Chester Ry. Co., comprising baggage, express and mail cars, smoking car and one first class coach. This train will be elegant throughout, and of most substantial design. This company, while they are young and only have a few miles of road, are getting everything first class. The train will be completed as early as possible, and at the same time the Baldwin Locomotive Works will turn a new engine for this train. The first class coach will have mahogany finish, ladies' toilet-room and washroom, gentlemen's toilet-room, beautiful spindle transoms, Scarritt high back seats; 52 feet long; design of interior to be beautiful and very tasty. This train, while it will be beautiful, will be in taste and judgment to requirements of railroad and much to their credit and the pleasure of their patrons.

Mixing Things.

A recent dispatch from Cincinnati gives some of the best illustrations we have seen for some time of how the average reporter mixes things when he attempts to describe mechanical happenings. The dispatch is headed

HEROISM OF AN ENGINEER,

and reads: "The story of an heroic engineer on a Pennsylvania excursion train which arrived here five hours late has just been made public. The engine was a three wheeler and said not to have been in good condition. However this may be, some 60 miles east of Columbia one of the drivers broke. The train was running 40 miles an hour, and the broken bar at once knocked the engine cab into kindling wood. It broke one six-foot driving wheel in two, and finally it turned its broken end into the boiler and let loose the scalding steam in vast volumes.

COULD NOT STOP THE TRAIN.

"The accident destroyed Engineer Mart Winter's appliances for communicating with the pneumatic brakes, and he could not stop the train. Each instant it wobbled to and fro and threatened to leave the track. *Then the engineer became a hero.* Scrambling over the tender with a monkey wrench in his hand, Winters climbed down under the first car, at the imminent risk of his life, and set the pneumatic brakes. The train came to a stop and nobody was hurt."

What the engineer really did, was to climb over the back of the tender, and pull the air hose apart with his foot.

Journal Lubricators.

A recent invention intended to improve car axle box lubrication is a very simple form of roller for conveying the oil to the journal. It consists merely of a shaft carrying the roller and a locking arm to hold the thing in position. The parties interested in the invention say: "The cheapness with which this device can be made, the ease of application and simple manner of removing at all times when in use, the impossibility of getting out of order, are but a few of the features which commend it to railroad men. By the use of this invention no waste is used in the boxes, but oil is poured in sufficient to allow the roller to carry it up on to the journal. It will be observed that no dirt is mixed with the oil resulting in cutting the journals and destroying brasses, to say nothing of the more costly delay to trains. When waste is used large numbers of men are required to stuff the boxes, which must be done at intervals along the journey, for the play of the axle up and down tends to pack the waste below, so that it no longer touches the axle, and the result is a hot box for want of proper lubrication."

This is all true, but the roller lubricator is not without its disadvantages. The oil in a box where no waste or absorbing material is used swishes to and fro and forces its way out past the dust guard and through the lid. Another disadvantage in the use of a roller oiler is that the car oiler walks round with his hook and seeing no waste in the box proceeds to fill it up. To make a success of the roller lubricator it is necessary to educate all oil box inspectors up to—them, the transcendent mental height of realizing that something other than waste can be employed to carry oil to the journal. When the question is examined in all its bearings a good many arguments will be found in favor of waste as an oil box packing, especially woolen waste.

A Much Changed Locomotive.

The Chicago & Alton Railroad Company are experimenting with a locomotive that has a variety of attachments designed by Mr. A. R. Cavner, a well known locomotive engineer. The objects sought to be gained are reported to be quite comprehensive, embracing economy of fuel, entire prevention of smoke, reduction of back pressure on the pistons, reducing the vibration on the flues whatever that may be, and making the locomotive available for an incandescent electric lighting plant at small expense.

The most conspicuous feature of change in the engine is that the smoke-stack comes up through a dome. That dome contains small pipes through which the feed water circulates to be heated before entering the boiler. The smoke-box is divided into two parts. The exhaust pipe and appliance for regulating the escape of the gases are placed in the part nearest the boiler, and the dome and smoke-stack are on top. In the front apartment of the smoke-box is placed an air pressure blower and a rotary engine to run it. The blower takes air through perforations in the smoke-stack dome, where it is expected to be heated and forces it into the ash pan, which is made close. The rotary engine also runs a dynamo which gives light to an electric headlight. An account of the invention says that Mr. A. W. Quackenbush, superintendent of machinery of the Chicago & Alton, is enthusiastically in favor of the improvements made on this engine.

Remember that the mechanic who studies and thinks, who seeks good society, who is cleanly in person, who is self-reliant, industrious, obliging and courteous, is the mechanic who is bound to rise in his profession. Remember, also, the reverse, that the mechanic who never studies or thinks, who seeks low associates and indulges in vicious dissipations, who is slovenly, slouchy and unpleasant in person, who is shiftless and loaferish, discontented, discourteous and disobliging, is the future inhabitant of the gutter, the groggery, the almshouse and the prison, and the future occupant of the pauper grave in the potter's field. And in this respect the mechanic is very much like the other man who requires to make his own way in the world. All who would force success must work for it and deserve it.

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

INVENTORS AND INVENTIONS.

Inventors have added wonderfully to the greatness, power and glory of this continent, and the records of the Patent Office indicate that the race is not growing smaller or likely to fall into insignificance, but we are reactionary enough to wish, that the ambition among our citizens to invent something and then rush it into the patent archives under the visionary plea that it is new and useful, were not so predominant. A person familiar with railroad machinery, cannot examine the patent records regularly without being saddened with the number of useless and impracticable inventions that are monthly covered by letters patent. The patent laws are framed for the encouragement of useful inventions, but it appears to us that most of the persons who pay for securing the protection of these laws have devised useless articles which no one else would accept as a gift. There is a mistaken impression abroad about the value of inventing. There is a tendency among many persons to elevate novelty above utility. If they can invent something different from an article in use for performing certain functions, they steep their souls in flattering unction, and imagine themselves inventive geniuses, although the novel invention is not nearly so efficient or useful as the old article. This idiosyncrasy of inventors has been painfully illustrated hundreds of times in the "improved" car couplers covered by patents. With many of the men who have devoted labor to the inventing of car couplers, there has been utter absence of perception of the practical object of car couplers. They have never reflected that an acceptable car coupler must be better than those in use. If they designed a coupler that would work and was patentable, they jumped to the conclusion that it must necessarily be valuable, and that railroad officers would be certain to chase the inventor asking for the privilege of using the device on payment of royalty. The inventors of some of the most absurd and impractical devices we have ever examined, have gravely assured us that railroad companies could not afford to do without their inventions. One of these was a safety truck that called for a second set of rails.

It is a mistake for a man to suppose that because he has failed in a variety of other lines of industry, that he can make a success as an inventor of railroad appliances. Yet there appears to be an impression of this kind abroad. The outsiders who have achieved success inventing railroad appliances, have begun by thoroughly studying out the difficult and trying service to which train and track mechanism is subjected. When this highly important knowledge was acquired they were in a position to begin work. If they had real inventive ability and were properly imbued with the necessity for making everything as simple as possible and certain in its action, they were on a fair way to get out something that railroad companies could use. Outside inventors very seldom, however, bring this equipment of knowledge and sense as an aid to their labors. They are inventors and must know by inspiration what would improve railroad machinery.

Electrical experts are said to find much matter for ridicule in the efforts made to invent new and valuable improvements in electrical machinery by men profoundly ignorant of electricity in all its manifestations. The same thing is noticeable in regard to improvements in railroad machinery. Fools rush in where angels fear to tread. If there is any line where special knowledge and skill are required to guide the inventor safely, there we are certain to find ignorant pretenders and contemptible charletans beseeching consideration for their worthless productions. The work of the men who have devoted intelligent study to the difficult subject of railroad signalling is crowded aside by the impractical appliances of professional inventors. The numerous inventors for the heating of cars that crowd the patent records, are mostly gotten out by men who know so little about the principles of heat diffusion that it would be unsafe to trust them with the designing of appliances to warm a small house, yet they claim to be perfectly at home in regulating the temperature on a train of cars rushing through the air at all varieties of speed and passing through all kinds of weather. But to witness ignorance in its most self-satisfied frame of mind pretending to throw knowledge on questions it does not understand, we have to interview the numerous inventors who are to be found in the highways and byways with pictures of new forms of compound locomotives under their arms. The designing of a successful compound locomotive calls for intimate acquaintance with engine forms and with the strength of material required for novel sizes and unknown stresses. It also involves highly intricate problems in steam engineering. An impression is prevalent that fortunes will be made by inventors of compound locomotives, and those who have failed with patent oil boxes, and spark arresters and bumper brakes have rushed into the compound locomotive arena. One inventor of a compound locomotive that looked like an ice making machine, insisted that his engine must save fifty per cent. of the fuel used by a common locomotive, because it used the same steam twice over, and therefore got double the work out of it. Another had designed the low pressure cylinders twice the diameter of the high pressure, and explained that he had adopted these proportions because he had heard it said that it was best to make the low pressure cylinder twice the size of the other one. Another inventor, ambitious to achieve fame and fortune on the wings of a compound locomotive, did not think there would be any difficulty in making a condensing compound locomotive, because the steam got so cold in passing through two cylinders that there was not much heat left in it to condense.

With all his faults we still love the inventor, especially the real inventor. We realize that he belongs to the class that shines through the names of Newcomen, Watt, Evans, Fulton, Howe, Westinghouse, Edison and a multitude of lesser lights whose rays have brought new happiness and comfort and life to mankind. But the inventor ought not to conclude at once that he is a second Watt because the Government has awarded him a patent, or that his opinion about the machinery upon which he wishes to hang his patent, is worth more than the judgment of all the rest of mankind. Securing a patent is no evidence that an invention is valuable. It is often merely testimony of the professional ability of a patent attorney. Inventions are generally estimated at their true value, and it is not wise for the owners to declaim against railroad officers as a set of hide-bound fossils because they refuse to make use of an invention that the patent office record says is new and useful. The patent office is amusingly liberal with its testimonials, and railroad officers are under responsibilities to shareholders and the traveling public, that compel them to be very careful about adopting new appliances which appear to be the least uncertain in promoting safety or economy.

NEW YORK TO CHICAGO IN SEVENTEEN HOURS.

The great interest manifested all over this continent in the performance of the train that made the extraordinary fast run on the New York Central last month, breaking all previous records for long distance train velocities, indicates that the American people are inclined to take as kindly to high speed trains as they did to high speed steamboats in the river racing era. The run demonstrates the practicability of train velocities on this continent that had heretofore been regarded as illusionary. Extremely high speed had been repeatedly made for short distances, but the impression prevailed that to maintain a speed of a mile a minute for hundreds of miles, an improved form of locomotive was necessary. This opinion was shared by many mechanical engineers, but railroad engineers who had given the subject attention and study believed that there were hundreds of locomotives in use that could maintain a speed of sixty miles an hour with a light load if there was no necessity for reducing speed between stopping points. It takes great power to accelerate the speed after a velocity of 45 miles an hour has been attained, but there is no difficulty in forcing the mechanism of high speed locomotives to produce a speed of 75 or 80 miles an hour if plenty of high pressure steam is supplied to the cylinders. The key of the high speed problem is the boiler. If the boiler is of sufficient capacity to generate steam as fast as the cylinders will use it, any properly designed passenger locomotive will maintain a speed of 65 or 70 miles an hour.

The practical effect of the fast run on the New York Central ought to be the shortening of the time of limited trains between New York and Chicago. The journey of 439½ miles from New York to Buffalo was made in 448 minutes, including all delays, the actual running time having been 435 minutes, a speed of almost 61 miles an hour for the protracted run. The trip was made under a variety of disadvantages for the reaching of a striking total. The engineers were under strict orders to exercise extraordinary care, and the idea of high velocity had a disquieting effect, and they were inclined to think the performance was to be something greater than it really was. All of them had run at higher speed during short spurts than they reached on that trip, but it was only after the work was done that each one realized that he might have done considerably better at certain stretches without danger. If the run was an everyday affair the men would make the best of every opportunity to gain a few seconds, and it is the seconds that count in a long journey.

The distance from Buffalo to Chicago by the Lake Shore & Michigan Southern is 540 miles. If this company were to take the train at Buffalo and run it through on the same time made by the New York Central, Chicago would be reached in less than seventeen hours after leaving New York. No person expects that trains with this speed will ever be run as a regular thing, but trains taking three hours more time on the journey between New York and Chicago would be a great convenience to certain business men who would willingly pay the extra charge. A man could attend to business in one city, say up to three o'clock, then take the fast limited and reach the other city the following day at eleven o'clock. This would give the opportunity of doing business that day and returning home in good season next forenoon. There has never been a public demand made for trains to provide this convenience, principally because there was a belief that the time could not be made. Now that it has been demonstrated that the time between New York and Chicago can be reduced to twenty hours without difficulty, there is likely to be pressure soon put upon the railroad companies to make that schedule.

THE DRESSING-ROOM MONOPOLIST.

The Northern Pacific in the construction of their sleeping cars have introduced a practice which ought to be followed by all sleeping car companies. The cars are fitted up without locks to the ladies' dressing room doors, but to afford complete seclusion a heavy curtain is hung inside the door, through which ladies can push their way in the event of the room being taken possession of by the kind of woman who considers she has the right to use it all day to the exclusion of others. There are women to be found traveling in silk and jewels whose selfishness and unkindness towards others know no control. This kind of female makes martyrs to her selfishness of all the ladies in a sleeping car. She generally gets up in the morning a few minutes before the others and takes possession of the dressing room. There she combs and brushes and frills and paints and powders and goes through other tedious mysteries of a woman's toilet more deliberately than she would do at home. She is traveling and needs amusement, and trifling in the dressing-room passes away an hour or two in the morning. It is nothing to her that half a dozen ladies are waiting to make themselves presentable. They may knock and shake the door in vain. The monopolist is in possession, and will hold the fort till she feels inclined to give it up. Then how coolly she walks out and how loftily she ignores the looks of indignation and scorn thrown at her by the ladies she has been imposing upon. The taking away the locks is certainly a move in the right direction. The Northern Pacific sleeping cars will be popular with ladies, but the dressing-room monopolist will be disgusted.

MAKE TEMPERANCE UNIVERSAL AMONG RAILWAY MEN.

There are few railroad companies now that do not place restrictions on their employés in the use of intoxicating drinks, and the safety of the men working on railroads and of the traveling public is decidedly promoted by the reform. We still find, however, that there is a tendency in some quarters to exempt the higher employés from the restrictions put upon trainmen and others forbidding them to use intoxicating beverages while on duty. On roads that are supposed to be dry as Sahara so far as the lower employés are concerned, private cars and pay cars are noted for inebrity and for the bacchanalian practices of those in charge. A railroad officer who indulges in these practices deserves to be turned out of the position he disgraces as readily as if he were only a brakeman. There is an impression abroad that such practices are tolerated only on the roads that run upon the confines of civilization, but this is a mistake. An important officer of a New England railroad was lately turned out of a Boston hotel, where he boarded and roomed, for disgraceful conduct, and this man's private car is said to be frequently the scene of orgies that are an outrage to decency. This sort of conduct is not only degrading to all concerned, but it has a tendency to lower the character of respectable railroad men in the eyes of the world. When a man is known

to be of potulent habits, he has no right to be in charge of railroad men, no matter what his ability may be. This is the accepted decision in regard to the men in the lower ranks of railroad service, and it is a rule that ought to be followed for high dignitaries as well. The president or manager who appoints a drinking superintendent, because he is a known hustler, is putting a demoralizing influence in the position where it can do the most harm.

MASTER CAR BUILDERS' LETTER BALLOTS.

A circular issued by Secretary Cloud announcing the results of the letter ballot of the Master Car Builders' Association, shows that four out of the eight subjects submitted have been rejected. The questions adopted are: Increasing the diameter of airbrake pins, rescinding the Fletcher box lid standard and adopting a new standard lid, adopting a journal box for a 60,000 car. The questions rejected are those relating to the lettering of freight cars, system of joint inspection, form of inspection and rules, form of report of defective cars received and delivered, and joint inspection defect card. Some of the new standards were adopted by a very small margin. The new journal box was carried only with four votes to spare, and the new lid came within twenty votes of defeat in a total vote of 537. It is difficult to predict just how a letter ballot will turn out, and we confess to several surprises in this one. There was so little opposition to the report on the lettering of cars that there seemed to be no reason for its rejection and we are still at a loss to know the grounds of opposition to that standard. On the other hand there appeared to be decided hostility to the proposal to change an established standard and the precedent is not a good one, but at the same time the Fletcher lid was very unsatisfactory and it is happily suppressed. The three proposed new standards relating to car inspection and carding were all well supported, but failed for lack of a few votes. There is good reason for believing that nothing is lost by having these standards postponed. The contending parties on matters relating to joint inspection are very earnest and it is well not to force standard methods upon a strong and active minority.

CAR COUPLER GAUGES.

In another page we illustrate new forms of standard gauges for the M. C. B. coupler which were adopted by the Executive Committee of the association at a meeting held in Buffalo early last month. We consider the adoption of these gauges one of the most important steps taken by the Master Car Builders' Association, and the arrangements made to provide gauges that will be of the same size cannot be too highly commended. The form of gauge first proposed in the report made by the Executive Committee to last convention was found unsatisfactory, and the form now adopted was designed by Secretary Cloud. The gauges are intended only for use on new couplers, and their employment will determine whether couplers are near enough to the standard contour to insure proper coupling, and also provide for the knuckle being maintained within the limits allowed for variations in rough castings. One of the gauges determines the contour lines and is made to fit against the face of the knuckle; the other gauge is for the knuckle and has two jaws that regulate the variation allowed. The knuckle must pass through one jaw but must not pass through the other, a well known practice in shop gauges being imitated. On the contour gauge there are movable points made of hardened steel which regulate the minimum and maximum dimensions and can be moved by means of a milled nut. Both gauges are formed of light cast iron frames finished exactly true. The Pratt & Whitney Co. have engaged to make the gauges and supply them at a low figure. As gauges made by this firm can be depended upon to be absolutely correct it is to be hoped that railroad companies and others will not attempt to make their own gauges, for such a practice would soon lead to hopeless confusion of sizes.

BUSINESS OF M. C. B. COMMITTEES.

The list of subjects prepared by the Executive Committee of the Master Car Builders' Association, to be reported on at next convention, is unusually attractive and comprehensive. For several years past the questions brought up for discussion by reports in the Master Car Builders' Convention have been few in number and of small importance, and the interest in the proceedings has grown indifferent. The way to keep the interest of the members awake is to give them good live subjects, and enough of them to prevent the devoting of time to trifles.

Joint Inspection is the first subject to be reported on, the committee being required to prepare a supplementary set of interpretations and illustrations of the rules of interchange. A large committee is behind this subject, and the members can do good missionary work if they will only induce those concerned in interpreting the Rules of Interchange to read the rules frequently in a spirit of fairness. The difficulty about the interpretation of these rules is that those who desire to act unfairly toward their neighbors persist in understanding the rules to suit their own views.

Air Brake and Signal Instructions is the subject for the second committee which has instructions to review the instructions proposed at last convention. If the members of this committee does as hard and conscientious work on their subject as was performed by the committee that had charge of it last year they will deserve the thanks of all railroad companies using air brakes. It is to be hoped that they can submit an amended code that will receive the support of the convention, for we find that there is a great deal of dissatisfaction because the rules submitted last June were not adopted as standard.

Cast Iron Wheels is the third subject, the scope of investigation being to show what improvements are being made in the manufacture of wheels, so as to secure greater uniformity in quality, in depth of chill and in distribution of metal for proper balance. If this committee succeds in making a report that will induce the wheel makers and railroad companies that are making inferior cast iron wheels to change their habits, the sufferers from this line of iniquity will rise up and call the members blessed.

Freight Car Truck Frames is the next subject, and the committee is expected to report upon the relative advantages of swinging and rigid bolsters, and upon the Fox pressed steel truck as compared with the prevalent form of car trucks. This is a very important subject. There has long been decided conflict of opinion among master car builders as to the relative merits of rigid and swing center trucks. One side contends that the swing center is a great protection to the load in a car and that this form of truck is much easier on the track than the other. Those who favor rigid truck centers contend that the advantages of the swing motion are purely imaginary and that swing center trucks are much more difficult to keep in repair than the others and that they frequently cause accidents by failure on the road. Several important roads have lately changed from using swing center trucks to those of the rigid form and we have not heard of any movement in the opposite direction. It appears to be about time that the bare unvarnished truth were known about the merits and defects of the two forms.

M. C. B. Automatic Coupler Standards and Limits is the fifth subject, the committee being required to consider the standard measurements and whether any additional or other measurements are desirable as standard, and to report upon proper limits of variation to be allowed from standard measurements. By the time this committee is ready to report railroad companies will have had considerable experience with the use of the new form of coupler gauge that has just been recommended for use by the Executive Committee of the M. C. B. Association. The new gauge makes a little more allowance than the old one, but it is still doubtful if castings can be made to conform to the requirements. If a change must be made this committee will be able to give the recommendations to that effect the benefit of that influence which comes from intimate knowledge of the requirements of actual service.

Steam Heating and Ventilation of Passenger Car Equipment comes next in order. The committee will report upon the general progress and the efficiency of different systems, and present drawings for a proposed standard location of ends of train pipe and a proposed standard connection in detail for a union between the hose and pipe, so that one style of coupling may be readily removed and another substituted in its place. If this committee succeeds in settling the latter part of its programme satisfactorily, it will do very well. The reporting on the most satisfactory system of car heating might turn out to be a most unsatisfactory performance at this stage of the business. The members of a committee might venture to report on the best form of car lighting, on the best kind of car chair, on the safest and most durable kind of steel tired wheel and not get themselves hurt very badly, but there certainly would be burned fingers at this time, if they had the audacity to express an opinion in favor of a particular system of car heating.

Steel Tired Car Wheels is the seventh subject and the committee is expected to report upon the relative merits of solid cast and wrought centers, and of plate centers bolted to hubs and tires. This is another subject whereon there will be remarkably little glory for a committee that makes an outspoken report.

Wheel Guarantee comes next, the committee being required to consider the communication from the Wheel Manufacturers Association read at last convention, and to report with recommendations. The communication in question was a request for a modification of the wheel guarantee to relieve the wheel makers from replacing guaranteed wheels that fail through no fault of the maker. The exact terms of the application for a change in the existing rules were: "That when wheels are taken out of service on account of sharp flanges, flat spots, comby or shelled out treads, or for cracked brackets or plates, and it is found on breaking up the wheels that the depth and character of the chill, and the strength and character of the metal in the plates, are up to the standard specifications of the association it shall be considered that the failure is due to the service and not to the quality of the wheel." If the change requested were made we see little of importance that would be left in the guarantee. On the other hand, wheel makers ought to be relieved from the responsibility for sharp flanges, for that defect is nearly always caused by faults of service such as badly matched wheels, wrongly constructed trucks and other irregularities that the wheel maker cannot control.

Steel Plate and Malleable Iron in Car Construction is the ninth subject. The committee will recommend a standard for stake pockets and a method in detail for attaching to cars. It will also recommend standards for center plates in detail, showing one for iron transoms and one for wooden transoms. There is great diversity in the existing forms of the two articles to be reported on, and there is no reason why a single standard of each should not be used. It is to be hoped that the labors of the committee will result in the establishing of two new standards of the association.

Standards of the Association is the next subject. The committee has been appointed to consider the standards already adopted by the association, and recommend what measures are expedient to secure their general adoption and use. The establishing of standard forms for cars that go all over this continent is reputed the most valuable work of the M. C. B. Association. The work done, however, is not unlike the favors of the fairy who gave to a child all the divine gifts except one, and the absence of that one made all the others of little value. The association establishes standards and the members talk eloquently about the advantages of the practice, and then pay no more attention to them. If the committee on this subject can prevail on a few of the roads that never think of adopting a standard to change their habits in this respect, railroad companies generally will be substantial gainers. If the committee would also investigate how near reputed standards come to the real size, it would come into possession of some interesting information.

Metal Brake Shoes is the last of the subjects to be reported on, the committee having been continued from last year. Some valuable tests were made last year with different metals and different hardness of metals for brake shoes, and Mr. Rhodes, the chairman of the committee, made a report which contained valuable information. It is to be hoped that the thorough series of tests the committee contemplated making last year may be carried out before next convention.

The entire capital stock of the Railway Age Publishing Company has been purchased by Mr. Harry P. Robinson, of St. Paul, well known to the railroad world as the editor of the *Northwestern Railroader*. Mr. Robinson was the founder of the *Northwestern Railroader* and held a controlling interest in the paper which has enabled him to consolidate the two journals. The paper is now known as the *Railway Age* with *and Northwestern Railroader* as a sub title. Mr. Robinson became chief editor of the paper and Mr. H. R. Hobart, who has been with the *Railway Age* since it began, remains as the second editor. The *Railway Age* has always been a highly popular railroad journal and the *Northwestern Railroader* developed great energy and enterprise under Mr. Robinson's fostering care. We anticipate that the consolidation of the two interests will build up a railroad journal second to none.

Literary Notes.

Progressive Examinations of Locomotive Engineers and Firemen. By John A. Hill, editor *Locomotive Engineer*, New York. Published by the author. Price, 50 cents.

This is a racy little book written in clear incisive language by a man who knows thoroughly the class he is writing for, and who understands how to give instruction in an attractive and impressive fashion. When Mr. Hill was an engineer on the Denver & Rio Grande, he was for several years master of the lodge of the Firemen's Brotherhood at Pueblo, and under his leadership the lodge became a school of instruction in matters pertaining to the locomotive and to train service generally. Here he became thoroughly conversant with the educational needs of enginemen, and the book just published is devoted to telling the engineers and firemen on the whole continent how to acquire a knowledge of the technical part of their business.

The practice long followed, by a few leading railroad companies, of requiring firemen to pass an examination before they are promoted to the responsible position of engineer, has been productive of such good results that the practice has spread rapidly. The railroads that promote firemen, without finding out what they know about the important duties they will have to perform, are every year becoming fewer, and it will not be long before the practice of examining candidates for promotion is universal. The crudity of the present system of leaving the fireman without guidance as to what he ought to know, and then subjecting him at the end of what might be called his apprenticeship, to an examination that decides his future employment, was recognized by Mr. Hill, and he offers his system

of Progressive Examinations as a sensible means of instructing the fireman gradually. His system is thus described:

"The progressive plan provides in the preliminary examination for the establishment of a gauge for candidates, one that proves that he is possessed of a common school education, is not afflicted with defective vision, personally desires employment in this line of work, and is prepared to stand its hardships, with the hope of promotion; is of proper age, and points out to the candidate what he is expected to learn and how best to learn it.

"The first examination occurs after one year's actual service. The record of the candidate for advancement is looked up, and he is examined in the rudiments of his business, the questions being of an elementary order, to see that the subject is getting the groundwork of his trade

. . .

"The second examination takes up the subject of fuel, combustion, boilers, and the duties of firemen. It insures his understanding something about the care of fires, draft appliances and economy of fuel, while he can still put in practice some of the lessons learned.

"The third examination occurs after the third year of service, and is a thorough one on the mechanism of the engine, brakes, etc. The examiner requires a remedy or a cure for every conceivable breakdown liable to occur on the road; and this examination should be complete enough to warrant the superintendent of machinery in promoting the successful firemen as needed, upon their presenting him with a certificate of examination on train rules and time card from the proper officers of the transportation department."

Besides giving particulars of the examinations, the book contains a great deal of sensible advice to enginemen and to the officers over them. If the plan recommended were generally adopted, we are persuaded that railroad companies would secure substantial benefits from the improved service rendered by the men operating their locomotives.

"Railway Law and Legislation" is the title of a new magazine which reaches us from Washington, D. C. The object of this new claimant for the patronage of railroad men is for information and discussion regarding laws, litigation, decisions, legislation; and political, social, financial and economic movements and development affecting common carriers. It starts out with well written articles on The Nicaragua Canal Project, Canadian Competition and Discrimination, The Postal Telegraph Bill, The Coming Committees, Interstate and State Notes, The Union Pacific Situation and The Courts. The magazine is conducted by W. P. Canaday and Goldsmith Bernard West.

"Condensed Suggestions for Steel Workers" is the title of a compact, small handbook which we have received from the Crescent Steel Co., through their representative, Mr. P. H. Patriarche. The book is packed full of valuable information for blacksmiths and others interested in the working of the finer grades of steel. The book is evidently the work of an expert in steel who has a profound knowledge of the science of metals. The subjects treated are: Annealing, heating to forge, heating, temper, furnaces, and final advice. It would be an excellent investment for every concern employing a toolsmith to put this valuable book in his hands.

"American Railway Master Mechanics' Association's Twenty-fourth Annual Report." This report has been published in the usual form. It is a little longer than usual this year, making a volume of 238 pages. The reports and discussions are very interesting, and constitute a work that can be read with pleasure and profit by all persons interested in railroad machinery. The report can be obtained from the secretary of the association, 140 Nassau street, New York, or from any of the railroad papers.

We have received from the *Western Railway* a beautiful poem entitled "The Open Switch," by Cy. Warman. The song has the true poetic ring and marks the author as a genuine poet. The song with music can be obtained from the *Western Railway*, Denver, Col., for 50 cents.

The Duluth Manufacturing Co. has been formed by a reorganization of the Iron Car Co., and the works have been started. They are building 100 cars for the East Tennessee, Virginia & Georgia.

A comical story comes from England, illustrating the danger of being too particular. In that country a railway carriage is only allowed to contain a specified number, and the guards rigidly enforce the regulation. A gentleman got into a carriage where every seat was occupied, "Will you allow me to stand?" he asked anxiously, "Certainly not!" exclaimed a passenger occupying a seat near the door. "The way these trains are over-crowded is shameful." "But," said the newcomer, "I am going only to the next station." "No matter," was the reply; "I shall call the guard and have you removed." Suiting the action to the word, the aggrieved passenger rose and vociferously summoned the guard. The newcomer saw his opportunity, and quietly slipped into the corner seat. "What's up?" inquired the guard, as he opened the carriage door. "One over the number," said the newcomer coolly. "You must come out, sir; the train is about to start," said the guard. And without waiting for an explanation he pulled out the surly passenger, who was left wildly gesticulating on the platform.

Personal.

Mr. W. J. Torrence, master mechanic of the Ohio Valley Railroad, has resigned.

Mr. H. M. Smith has been appointed superintendent of machinery of the Terminal Railroad Association of St. Louis.

Mr. Farley, so well known among railroad supply men, has been elected Secretary of the National Hollow Brake Beam Company, Chicago, Ill.

Mr. S. T. Smith, general manager of the Denver & Rio Grande, has resigned. The stockholders wanted to curtail his authority, and he would not stand it.

Mr. George Richards, the well known master mechanic so long with the Boston & Providence, has been appointed master mechanic of the Elmira, Cortland & Northern.

Mr. A. M. Mozier, superintendent of transportation of the western lines of the Erie system, has been promoted to the position of general superintendent of the same territory.

Mr. Peter H. Peck, master mechanic of the Western Indiana & Belt Railroad, has been elected President of the Western Railway Club. Mr. W. D. Crosman was elected Secretary.

Mr. P. Hayden, for some years general foreman of the Baltimore & Ohio locomotive shops at Parkersburg, W. Va., has been appointed master mechanic of the company's shops at Piedmont, W. Va.

Mr. L. G. Matthews has been elected president of the Duluth Manufacturing Co. Many friends will remember Mr. Matthews, who was long with the Pullman Palace Car Co. and with the Ohio Falls Car Co.

Mr. T. R. Gable, for a number of years assistant to the general manager of the Atlantic & Pacific has been appointed general superintendent of the road, the position of general manager having been abolished.

Mr. A. S. Douglas, for several years division master mechanic of the Texas Pacific at Big Springs, Tex., has been promoted to the position of superintendent of motive power of the road, succeeding Mr. M. W. Elliott, resigned.

Mr. Thomas Milan, superintendent of motive power of the Mexican National at San Luis Potosi, Mexico, has been on a visit to the United States lately. His principal business was the inspecting of cars under construction for his road at the St. Charles Car Works.

Those who have been in the habit of attending the conventions and have made the acquaintance of Mr. F. D. Adams' amiable wife, will be sorry to learn that she met with a serious accident in getting off a train, which is likely to confine her to bed for several months.

Mr. D. H. Moffat, president of the Denver & Rio Grande, has resigned. The English stock holders of the company appointed an official to control the president in matters financial, and Mr. Moffat intimated that he was not in need of a dry nurse, and give up his position.

A good portrait of Mr. A. W. Quackenbush, superintendent of machinery of the Chicago & Alton Railroad, is given by a Bloomington paper. From the article accompanying the likeness we understand that Mr. Quackenbush is highly popular with the people in the town where his headquarters are located.

Mr. Walter D. Crosman, who was for several years associate editor of the *Railway Review*, and later editor of the *Railway Master Mechanic*, has accepted a position as agent for the *Railway Age* in St. Paul. Mr. Crosman is secretary of the Western Railway Club, and is highly popular among railroad men of the West.

Mr. F. C. Merrill, so well known among railroad men of the West as trainmaster of the Minneapolis & St. Louis, superintendent of the St. Louis & San Francisco, and later as superintendent of the Western lines of the Erie, has decided to quit railroad life. He takes an important position in a manufacturing firm in Missouri.

Mr. R. J. Gross, the well known general agent of the Brooks Locomotive Works, has accepted the position of agent for the Columbia Exhibition in Europe. His principal mission will be to induce foreign manufacturers to exhibit their products in the Chicago World's Fair. Mr. Gross sailed for Europe early in September.

Mr. William C. Stroud, a partner with Burnham, Williams & Co., proprietors of the Baldwin Locomotive Works, died on Sept. 21. Mr. Stroud was 53 years of age at the time of his death, and had been with the Baldwin Locomotive Works for 22 years. He began work as bookkeeper, and rose by merit to have charge of the financial department.

Sir Henry Tyler, president of the Grand Trunk Railway, edified the members of a church in an Ontario town by taking the lead in divine service. The event was no doubt interesting, but there are places not noted for sanctity where Sir Henry would be much more in his element than in a pulpit. We happen to know the president of the Grand Trunk!

Mr. Harry P. Robinson, the bright and well known editor of the *Northwestern Railroader*, has distinguished himself during the past month in a manner worthy of record. First he secured control of the *Railway Age*, and then he lost control of himself by marrying one of the handsomest young ladies in St. Paul. Harry, we wish you luck all round.

Mr. James L. Frazier has been appointed superintendent of the Truckee division of the Southern Pacific. Mr. Frazier is a Virginian by birth and entered railroad service as a civil engineer on extensions of the Chesapeake & Ohio. He had considerable service of the same kind on other Southern roads and was for some time a superintendent on the Chesapeake & Ohio.

H. W. Ensign, of the Ensign Manufacturing Company, of Huntington, W. Va., will be the superintendent of the new freight car works to be built at Carteret, N. J., by the Canda Manufacturing Co. An order has been placed with Craig Ridgway & Son, of Coatesville, Pa., for the equipment of hydraulic cranes. The new works expect to be in operation in part by Nov. 1.

It is claimed for Albert Johnson, of Raleigh, N. C., that he is the oldest locomotive engineer in point of service in the country. He had charge of an engine on the Richmond & Fredericksburg Railroad away back in 1836, in the days of strap rails and "snakeheads." He is still a railroad employé, and can be seen in all kinds of weather in the yard at the Raleigh & Gaston depot.

Mr. J. A. Sague, master mechanic of the railroads of Jamaica, is visiting the United States for the purpose of purchasing new machinery for his road. Nearly all the laborers on the railroads on the Island of Jamaica are negroes. This includes engineers, firemen, machinists and all other classes of skilled labor. Mr. Sague speaks very highly about the ability and efficiency of the men under him.

Mr. Edwin D. Worcester, who is a prominent officer of the Vanderbilt lines, was once practically owner of the New York Central & Hudson River Railroad. He is a particularly bright and genial gentleman of 70 years with milk white hair and a fresh young face. In his youth Mr. Worcester was a mechanic, and he still takes a lively interest in the designs of railroad machinery. He is full of wonderfully interesting reminiscences of the machinery that he saw in his youth, and is very ready in illustrating details by pencil sketches.

We learn that Mr. W. Lee Brown, who was for several years chemist in the laboratory belonging to the Chicago, Burlington & Quincy, has associated himself with Mr. Geo. H. Ellis, another chemist, and established a business as analytical chemists and assayers in Evanston, Ill. They make a specialty of examining waters, soaps, paints and lubricants, work which railroad companies that do not have laboratories require to get done outside. From an intimate acquaintance with Mr. Brown we feel safe in saying that anything sent to him for analysis will be conscientiously attended to.

It is with regret that we are called upon to chronicle the death of Hon. Wm. L. Scott, who died at Newport, R. I., Sept. 19, of "heart failure." Mr. Scott was vice-president of the Eureka Tempered Copper Company of North East, and one of its most prominent directors and heaviest stockholders. It was due to Mr. Scott's encouragement that this company was organized, as he was director in over 22,000 miles of railroad, and realized the benefit that tempered copper would be. Mr. Scott was well known in both business and political circles. He was a member of Congress during two terms, had been three times mayor of Erie, and was a warm personal friend of ex-President Cleveland.

Mr. John M. Thurston, the well known railroad attorney, is a good representative of what courage, energy and perseverance can do for a young man who has to make his way in the world by his own unaided exertions. By laboring on any jobs that could be obtained he earned enough to pay board and expenses while studying law, and after getting admitted to the bar he considered his fortune made. That was about 1865, and he determined to go West and grow up into fame and fortune with the young city of Omaha. He found to his sorrow that lawyers are more numerous than clients in that portion of Uncle Sam's domains, so he returned East as far as Chicago, and nothing better turning up he went to work as a hack driver. That was in 1868, and about his first experience in his new sphere of action was to carry the delegates to the Republican National Convention from the various depots and hotels to and from the convention hall. Just 20 years later, the hackman who carried passengers to the National Convention that nominated Grant in Chicago, presided as a temporary chairman over another Republican National Convention that nominated President Harrison.

An accident occurred on the Pennsylvania Railroad at Waverley last month which revives the stories of the times when strap rails nailed to wooden string pieces were used on that line and occasionally curled up through the bottoms of the cars. An eastbound Rahway train was passing rapidly over the Waverley switches when the passengers in one of the cars were frightened by a sharp shock and a ripping sound. The cars went on well enough then and the fears were allayed, but when the car inspectors examined the train at Jersey City they found that the front car had picked up a switch rail 22 feet in length, and it was jammed in between the truck frame and the floor of the car. The train was running at a 50-mile rate when it picked up the rail.

Communications.

Doing New Work in Railroad Shops.

Editor National Car and Locomotive Builder:

Your correspondent Sam. Short is what Artemus Ward called "an Amoosin' cus," but as a writer on a master mechanic's duties he is a dead failure. I gather from one of his letters that he had once been a master mechanic on some unfortunate railroad. It is not surprising that he is now only a drummer. The class that Mr. Short belongs to is too smart for railroad life, and the members of it officially die young. The woods are full of these people who failed as railroad men, and are now shouting themselves hoarse trying to teach practical and successful men their business.

Your correspondent is particularly sarcastic on some men who are guilty of the iniquity of doing new work in their shops, and his jibes against those who make a tool occasionally are intended to be crushing. All this comes from being too narrow. Railroad shops and railroad business generally are run very much like the affairs of other companies and individuals. It would be following sound business policy for all individuals and companies to buy in the cheapest market, and in quantities that would procure wholesale prices, yet this is seldom done. Probably this Sam. Short, who sets himself up as "A guide, a buckler, an example," buys his potatoes by the bushel when he could save money by putting in a supply in the fall when these things are cheap. Instead of following the far-sighted policy, he buys things when he wants them and when he has the money to spare. Railroad companies cannot justly be blamed for doing the same thing. A master mechanic may get the work and material for a few new engines by spreading the requisitions and labor bills over a considerable period, when a request to expend a lump sum in buying the engines would meet refusal. A master car builder is in the same position about procuring new cars that are badly needed, but which have to be partly smuggled into form. This applies even more forcibly in regard to tools. Take the case of the bulldozer that your correspondent was so much disgusted at seeing made in a railroad shop. A tool of that kind is almost an absolute necessity in some shops, yet it is extremely difficult to convince some managers that it would repay their companies many times to purchase the tool. When a master mechanic cannot convince his superiors that a useful labor saving tool is necessary, he will make one if he has the means of doing so. It is the same with the other kinds of tools that are made in railroad shops, because the requisition for purchase cannot be got. The men who follow this practice are making the best of the situation, and they are the men who are successful in railroad life; while your Sam. Shorts who wait till they can get everything needed through superfine channels, get left, and are pressed by natural circumstances out of railroad life. New England.

Parts for Which Owners of Cars Ought to Be Responsible.

Editor National Car and Locomotive Builder:

The additions of worn out brake-shoes, journal-bearings, truck and body bolsters, etc., renewals of which are chargeable to owners, and took effect Sept. 1, 1891, must give to each and every intelligent car inspector an idea that there are other parts of a car worn out by continuous service that should come on the same level as the aforesaid. Just where to draw the line is one of the difficulties that must be solved by experience, adding at each annual meeting what would seem the most definite. Take for example sills broken over the transom, which is probably one of the most difficult things to determine when sills are newly broken, and to an extent requiring their removal, or when the car shows the unfair usage to make it fair that the delivering company should be responsible. On the other hand, and we will take for instance a new car which may be a model to the designer, yet there will be more strain on one or more sills than the others, the consequence of which will be that some one of them will check, possibly only a half inch, which will relieve the strain for the time being. Surely no company would refuse the car for such defect; yet there is the commencement of a defect which will gradually grow worse until the sill is broken to the extent of forcing the sill on each side to carry the burden dropped by the defective sill, and they in turn breaking, making it necessary for their removal. Years may intervene between the time of the incipient break to the time when renewal becomes necessary. Under these circumstances should not owners be responsible?

The same might be said in regard to other parts of cars which continually break under ordinary service and are not strong enough to stand the requirements of to-day.

J. C.

Why Staybolts Break.

Editor National Car and Locomotive Builder:

In last May's number of the National Car and Locomotive Builder, Mr. John Hickey, Superintendent of Motive Power of the Northern Pacific Railroad Company, gave some very excellent practical information on the construction, care and management of locomotive boilers. I agree with Mr. Hickey on all the improvements he so well offers in his valuable paper. He does not say that drilling the ends of the staybolts does more than guard against the danger of having a large number broken in proximity to each other. In other words, the drilling helps to make breakage known and then points out the weak points. This is all that it does.

It is not the right way to guard against danger by first producing its cause, as evidenced and shown in the losses from broken staybolts. It ought to be apparent that drilling reduces their strength, and may be likened to the practice of testing boilers beyond their safety point. Indeed, both are injured before they are put into service.

Another of your correspondents charges the cause of broken staybolts to the powerful brakes in the hands of careless engineers, suddenly stopping their engines, thus forcing the water to the front end, and adds that the reaction is terrific and away go the staybolts. This is an entire mistake, for such a condition is impossible. Re-action the danger. No, the right way, if practiced, will certainly meet the difficulty. I have much experience in locomotive service, and am fully persuaded that if staybolts are put in properly, in size and tightness, there would be little, if any, trouble from broken bolts. As long as conventions will talk for the sake of talking, and let ignorant workmen put in loose staybolts, just so long will the dangers be present.

Staybolts should be put in so tight that they would require very little riveting. By doing this the evils caused by putting in loose staybolts and, in truth, breaking the ends to make them water and steam tight, will no longer be charged to powerful brakes or other improvements.

J. T. Connelly.

Further "Unpublished Correspondence" from 'Charles Dickens" on Engine Mileage.

Editor National Car and Locomotive Builder:

Some hitherto unpublished correspondence of Dickens having been recently given to the world, and more being in request I have thought the public, especially of Manchester and those engaged in the mechanical engineering profession, would regard as opportune and otherwise appreciate a further contribution of the kind direct from myself.

It will be remembered from my already published correspondence how I was turned out of the Crewe Works on Feb. 6, 1882, sent to Longsight to run as often as I could between Manchester and London, as a minimum day's work, in charge of David Pennington and Leigh Bowden, taking the 7:45 a. m. train out of Manchester and returning with the 4 o'clock out of London, and was so regularly on the road, in fair weather and foul, in snow and rain, that by Sept. 7, 1886, when my performance had just exceeded half a million of miles, the friends I had so often carried safely christened the trains I worked the "Charles Dickens," and had ceased mentioning the time of departure when making their traveling arrangements.

On March 17, 1886, I lost my faithful groom, David Pennington, through his eyesight being unfortunately injured, but Josiah Mills, who succeeded him, together with his mate, Leigh Bowden, who has been with me from the commencement of my career, have been so attentive to my various daily wants that to-day, when about half-way between Mow Cop and Harecastle, on my 2,651st trip to London and back, I accomplished the, so far as I know, unparalleled feat, on either this or the other side of the Atlantic, of running 1,000,000 miles in nine years and 219 days. In addition to the 2,650 to London and back, I had run 92 other trips, consuming 12,515 tons of coal and evaporating 93,237 tons of water. Although it may seem more extraordinary than my athletic achievement, through the effective arrangements of my designer, and the convenient interchangeable system peculiar to the Crewe creations, I have now two new digestive organs supplied to me since my birth, but such has been the quality of the food and medicine received throughout that neither these nor the original are yet worn out, in fact the first was in such excellent condition that after I laid them aside my sister "Snowdon" traveled 191,236 miles with them, "Balmoral" afterward appropriating them and still running with them. "Courier" became enamored with my second, and is making a good record therewith. My third will, I hope, raise the steam for me for many a day to come; and I myself trust to witness, with many old acquaintances, the dawn of the 20th century, although whether my constitution will hold good for another million of miles remains to be seen. At present I feel no symptoms of decay; all my energies are unimpaired, and, by the kind indulgence of my master, I and my grooms are just off to enjoy a week's holiday during the gloriously fine weather now prevailing. Begging your kind acceptance of the accompanying latest photograph taken of me at the Crewe Works, I am, etc.,

"Charles Dickens" (Engine No. 955.)

Longsight Station, London & North Western Railway, Sept. 12, 1891.

I have no objection to this further letter from "Charles Dickens" being published. The statements made are correct. F. W. Webb,

Chief Mechanical Engineer, L. & N. W. Ry., Crewe.

Variable Exhaust Nozzles.

We have received from Mr. F. Mertsheimer, assistant superintendent of motive power of the Union Pacific, a letter giving some interesting information regarding his variable exhaust nozzle, a cut and description of which were published in our last issue. The letter says: "I have noted your remarks regarding the serrated opening. This is just where the success of this nozzles lies as a fuel saver, as it permits of running a larger area of opening than with the common round nozzle, as the discharge of steam is spread into a larger volume, thus filling the barrel of stack and making a much better draft. This has been fully demonstrated in the changing of our engines from the old style to the variable nozzle. In engines running with a stationary nozzle, with openings of 4, or 4⅛ inches, we now use a variable nozzle with a opening of 4½ inches, and as high as 5 inches, thus making a saving of from two to four tons of coal each round trip. We have obtained this same result from its use on every engine on which it has been applied, and we have at present some 75 engines equipped with this variable exhaust.

"The nozzle has the serrated openings in any position the cap may be turned, either full open, closed, or any intermediate position. Should the fire become dirty the nozzle can be closed down to the size usually used on the common nozzle and the fire thoroughly cleaned within a distance of not more than a quarter of a mile. We have obtained the same results as spoken of above both with the high single and the low double nozzle with diamond stack."

The letter then proceeds, by the aid of blue prints, to describe the variable exhaust nozzle as applied to three different classes of engines. One print shows a single nozzle with opening from 3⅞ to 5 inches for engines with extension front and open stack. The second print is of a low double nozzle for eight-wheel engines with diamond stack. The third print shows a double nozzle for the same class of engine as the first one, but placed low for a diamond stack.

The letter then continues: "Our eight-wheel engines that have heretofore run with a nozzle opening 4 or 4 1/16 inches are now using the variable nozzle with a 5-inch opening. Our engines as per prints "B" have been running in the past with a 2⅞-inch opening, and in no case larger than 3 inches and are now running with a low double nozzle with a 3½-inch opening.

"I will add that there is no difficulty experienced by this nozzle gumming up or sticking, if applied as per blue prints. This has been thoroughly proven on all the engines equipped with the device on this system. Our engines, in addition to making a large saving in fuel by the use of this nozzle, are also capable of pulling two more loaded cars than before and are so rated and doing it.

"For your information I give you a brief statement concerning the performance of the first engine equipped with this nozzle on this road: The engine referred to is No. 820, eight wheeler, cylinders 18 × 24, extension front end and straight stack. In February, 1890, we equipped this engine with a high single variable nozzle. Since that time no repairs of any nature have been necessary to the nozzle. During the year February, 1889, to February, 1890, this engine made 41,077 miles, consuming 1,746¼ tons of coal; she was then running a stationary nozzle; during the year February, 1890, to February, 1891, she made 58,360 miles and consumed 2,055¼ tons of coal, running with a variable nozzle. This shows an average of 23.52 miles per ton of coal 1889–1890, and 28.39 miles per ton of coal in 1890–1891, or an increase of 4.87 miles per ton with the variable nozzle, or a total saving of between 350 and 360 tons of coal during the year by the use of the adjustable nozzle. This engine, during both years referred to, was on the same train—fast passenger out of Kansas City, with the exception that in 1890–1891 she had an additional car in train—a dining car, thus making a handsome saving in fuel with an additional car hauled.

"The actual cost of this nozzle complete applied to an engine will not exceed $20. I trust that the above information and blue prints will give you a better idea of the construction and workings of this device."

Twenty-five locomotives on the Baltimore & Ohio road have been equipped with smoke consumers, an invention of the superintendent of motive power on the Baltimore & Ohio, which is said to be showing excellent results so far as it has been tested.

An accident of a startling character happened to a train on the Central Railroad of New Jersey last month, resulting in the death of a passenger. As a passenger train was running at the usual speed near Jersey City a loose car door on a freight train struck one of the passenger cars in such a way that it crushed the window, and a board from the broken door struck a passenger inside the car, killing him instantly. There have been accidents of this kind repeatedly from the loose and careless way that the doors on many freight cars are secured, and this fatal accident ought to be a lesson to those in charge of freight cars, urging them to greater care of doors. The country is strewn with the doors belonging to the cars of certain roads which are evidence of the mismanagement of those in charge. It is bad enough for the companies to stand the expense due to constant loss of doors, bnt it is more serious still when the loose doors become a menace to the traveling public.

Gauges and Limits for the Standard M. C. B. Automatic Coupler.

Secretary Cloud, of the Master Car Builders' Association, has sent out the following circular and illustrations:

In fulfilling the duties assigned to the Executive Committee by the association in regard to gauges and limits for the standard contour and measurements of the Master Car-Builders' automatic coupler when new, the committee has carefully reconsidered the whole question since the discussion on its report to the Convention in June, and in view of this discussion and the action of the Convention upon its report the committee believes that it is the desire of the association to have it act under the instructions of the Convention of 1890, and to make arrangements whereby all parties interested may be able to procure sets of gauges so that all sets will be alike, which can be used to determine whether any and all new couplers of this type are near enough to the standard contour established by the association to insure proper coupling with one another, in so far as it can be insured by close adherence to the standard contour, and also to establish limits of variation for such of the standard rectilinear measurements of the coupler only as will promote the interchangeability of couplers in place upon cars.

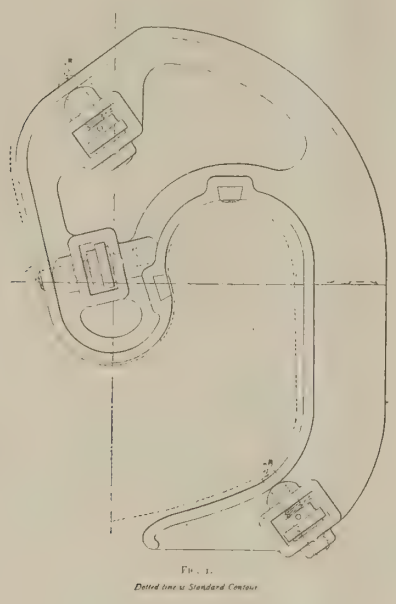


Fig. 1.
Dotted lines is Standard Contour

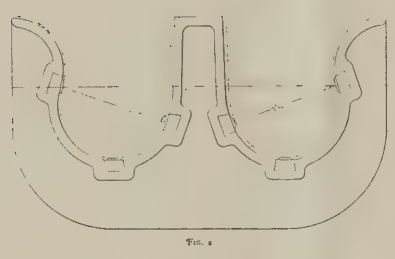


Fig. 2

The committee therefore announces the gauges shown in Figs. 1 and 2 for the contour line, and thickness of knuckle, respectively, with the limits of variation allowed by these gauges, and it also announces the limits for the standard rectilinear measurements, as given in the table with Fig. 3.

The gauge for new couplers shown in Fig. 1 is announced in lieu of the gauge proposed in the committee's report to the association, because it provides means for gauging the contour lines, excepting the thickness of the knuckle, at points throughout the whole essential extent of the standard form of contour, and it controls the variation in both directions from the standard, whereas the gauge proposed in the report was only a minimum gauge for a portion of the standard contour, and its use would involve numerous measurements at different heights for the maximum variation, instead of gauging for both limits. The figures shown for the variation allowed with this gauge on Fig. 1 are the same as those recommended in the report at the same points, and the additional point on the back of the knuckle is allowed to vary the same as was recommended at the guard arm.

The gauge for new knuckles, shown in Fig. 2, is announced as a proper gauge for knuckles, allowing $^1/_{16}$ inch variation each way from the standard dimension of 3 inches, instead of $^1/_{16}$ inch one way only, as recommended in the report, because it is thought desirable to allow more than $^1/_{16}$ inch variation, on account partly of the necessary taper in cast knuckles.

The limits shown in table with Fig. 3 are announced as proper limits of variation for the standard rectilinear measurements, which are the same as the limits recommended in the report, except that the standard distance *A* of 2 inches is included herein with an allowable variation of $^1/_{16}$ inch each way, and the cross section *D* is allowed to vary $^1/_{16}$ inch each way from the standard measurement of 5 inches, instead of only $^1/_{16}$ inch one way, as recommended in the report. The Executive Committee considers it inexpedient to announce limits of variation for dimensions which are not standard, but which were mentioned in the report, because the Convention ordered that a committee be appointed to report next June on any new standard measurements and limits which may be desirable in connection with the coupler. It is also considered undesirable to provide any specific measuring instrument for the limits of rectilinear measurement given in table with Figure 3, as these distances may be measured in numerous ways by whatever means are best available.

Fig. 4 shows the standard contour lines, for convenience of reference.

The Executive Committee has made arrangements with the Pratt & Whitney Company, of Hartford, Conn., to furnish gauges as shown in Figs. 1 and 2, so that every set furnished will be like every other set and proved by master gauges provided and held by the Pratt & Whitney Company for that purpose, a duplicate set of which master gauges

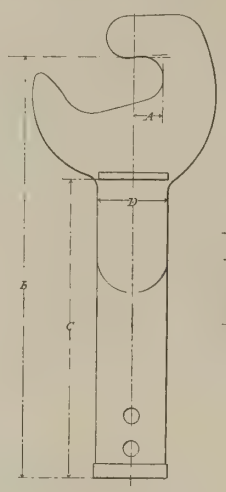
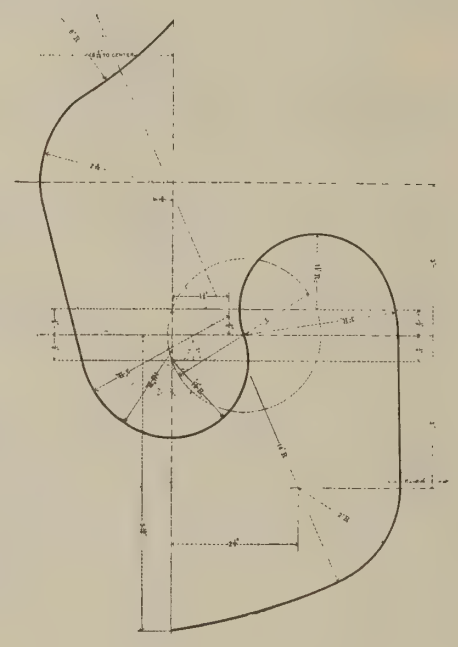


Fig. 3

	Standard.	Max.	Min.
A	2 in.	$2\frac{1}{16}$ in.	$1\frac{15}{16}$ in.
B	30 "	$30\frac{1}{8}$ "	$29\frac{7}{8}$ "
C	$21\frac{1}{4}$ "	$21\frac{3}{8}$ "	$21\frac{1}{8}$ "
D	5 in. sq	$5\frac{1}{16}$ "	$4\frac{15}{16}$ "



will be filed in the office of the Secretary of the Association for use in settling any questions in dispute about the accuracy of gauges. The frames of the gauges will be made of the best quality of gray iron, with plain lettering, as shown on the cuts, and the gauging points will be of hardened tool steel.

The price of the gauges will be $35 per set at Hartford, providing that as many as 50 sets were ordered in advance, but if the number of sets ordered will enable them to make 100 sets in the first lot the price will be ten per cent. less, or $31.50 per set.

Parties who wish to procure sets of these gauges should therefore place orders with the Pratt & Whitney Company at an early date. and, if they prefer to do so, they can make the order conditional on the price not exceeding $35 per set, in which case the necessary fixtures, tools, etc., for making these gauges properly will not be prepared by the Pratt & Whitney Company until they have orders for 50 sets in hand.

Track Jacks.

At the Minneapolis Convention of the Railroad Road Masters the following report was adopted:

. . . Your committee has seen newspaper notices of jacks that work below the rail, which could be worked at all times, without regard to the movement of trains, but we have been unable to find the inventors or manufacturers of such a jack, and we must therefore deal with those now in general use, and respectfully recommend the following standard and requirements:

For a standard we recommend a double acting, compound lever jack so constructed as to raise only half a notch at a stroke, up or down, made of two pawls of cast steel; frame to be of malleable iron, the lifting bar to be of the best grade of steel, capable of standing a strain of 90,000 pounds to the square inch. Bushing to be made of the best quality of cast steel, and so arranged as to be removed and replaced promptly by any ordinary section man.

For ordinary section work a jack of eight or ten tons capacity, weight not to exceed 60 pounds, with lifting bar not less than $1\frac{5}{8} \times 1\frac{5}{8}$ inches in section, and to raise at least 12 inches, with a base of about 7 × 12 inches. . . .

We must have a jack that can be relieved quickly of its load and removed from the track almost instantly when required, and one that will sustain a large weight upon the lifting bar; positive in its action, speedy in doing its work and durable in its design.

We trust the day is not far distant when a jack will be put on the market, which will be so constructed that section men may never say that the jack was the cause of the wreck, by reason of faulty design. Until that time arrives, however, we do not deem it out of place to embody in this report the suggestion that roadmasters issue more stringent and definite rules with reference to the use of the track jacks, and that, wherever it is possible, to always work it on the outside of the rail.

In cases where it has to be worked between the rails and the view is obstructed, always protect the point of danger by a flagman as per time card rules. Should the foreman be short of men for flagmen, and cannot comply with such instructions (which is often the case), then use danger signals in the nature of flags and torpedoes the required distance out from the place of danger. Where jacks are worked on double tracks, the man in charge must never leave it while it is in position under the rail. The chances for striking both man and jack are here double, and every precaution against accidents must be taken.

Novel Railroading.

Within a few months it is expected that the first single rail and saddle track railroad will be built in Oregon. Work on the first locomotive has been commenced at Portland. Mr. Mahana, the inventor, is confident that the trial of his system will result in success. A noted inventor and a gentleman who has given much attention to rapid transit, says to the editor of the *Gazette* that he believes the method of transporting the mails and other matter requiring speedy delivery, will be upon a small saddle track railroad elevated upon posts and propelled by electricity with lightning speed. He thinks that such a road may be constructed with small cost between New York and Chicago, that, with the application of present known electric and other devices, may be made to deliver the mails in one-half and possibly one-fourth the time that is now required to deliver them. The cars would be small, possibly not to exceed two or three thousand pounds in weight when loaded, and he thinks it would be unnecessary for any person to ride upon the cars, their operation between the stations being entirely automatic, thus avoiding all risk to human life in their terrific speed.

This form of rapid transit for mails and light packages he believes will be superior to that of the pneumatic tube system.

The cars will of course occasionally be wrecked from defects of the track and other causes, but as they carry no passengers, there will be no loss of life, and it is possible that they may be constructed so that there will be little damage to their contents. They will be constructed, so as to suffer the least from atmospheric resistance, nearly in the form of the projectiles from heavy field pieces, and the farmer may occasionally be startled by the appearance of a gang of men in his cornfield digging up the ground in search of a car that has jumped from the elevated track and disappeared in the bowels of the earth.—*Railway Service Gazette.*

Successful Things That Ought Not to Work.

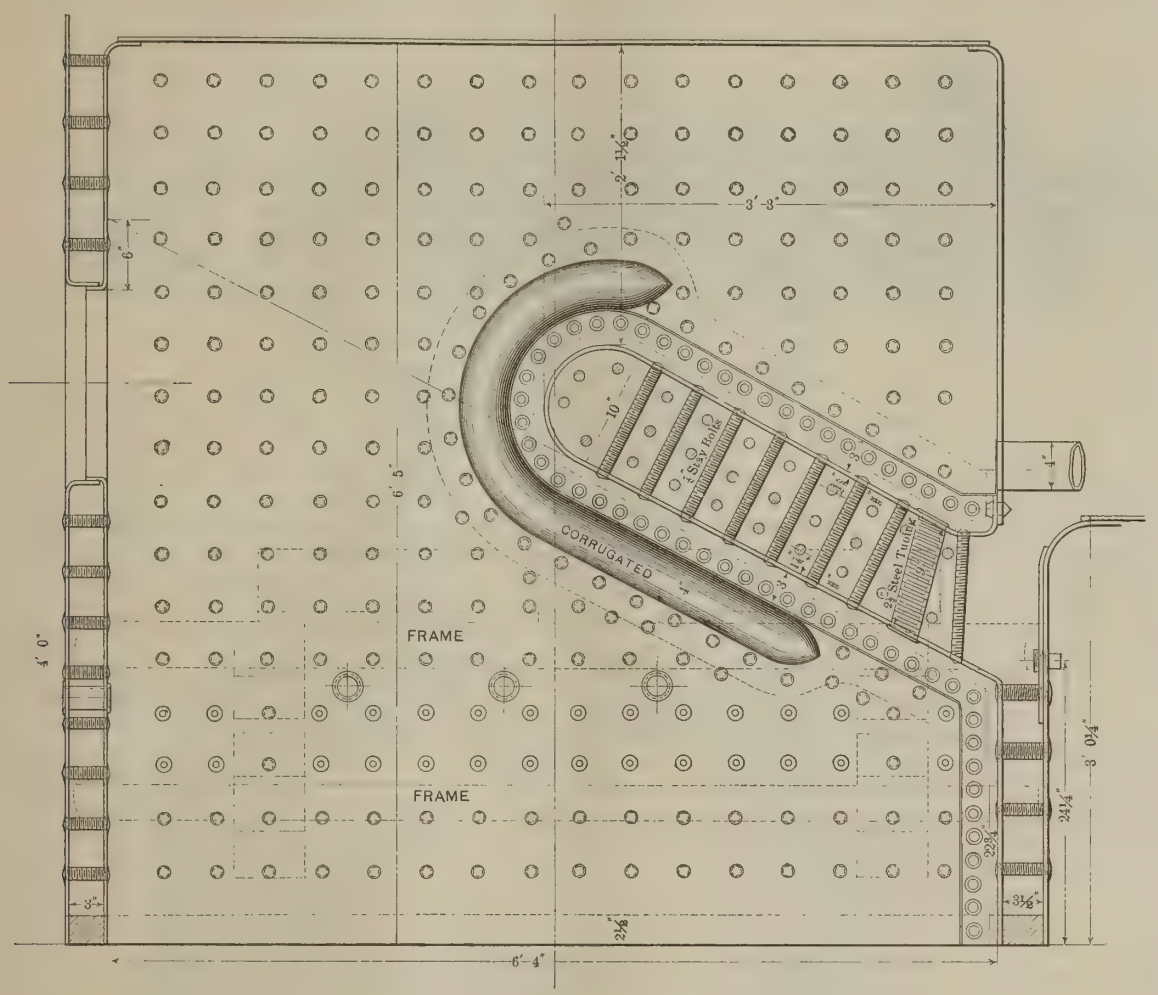
It all sounds very natural that the *Engineer*, the English technical journal, should thus early take the trouble to show how impossible a craft the "whaleback" is and must always be. The modest and promising task, as it calls it, of its transatlantic kinsmen "teaching their grandparents the way to make barges" that journal evidently considers little short of an affront. "A moment's consideration," according to the *Engineer*, will show how dangerous the whaleback is for ocean navigation, and how impossible it is that the new Yankee craft could have any advantages, and then it makes sure that shipowners would never, never encourage a type of vessel so entirely unlike "the typical steamers of our mercantile fleet." Let us see; wasn't it the English engineers who proved beyond a peradventure that a locomotive could never be made to draw a train over smooth rails? Wasn't it a well known English scientist—Dr. Lardner—who undertook to eat the first steamboat that crossed the Atlantic? And didn't the English naval authorities demonstrate how absurd it was to suppose that the screw propeller could ever move a vessel through the water? These things were altogether too wide departures from English conservatism to be possible. The whaleback, in addition, presents the objection of being an American contrivance. Of course it is still an experiment, notwithstanding some successful voyages; but it is one at least from which something may be hoped. And, as in the case of some other experiments, it may hereafter be a little embarrassing to have proved too much against it in advance.—*Ex.*

A fiend named Louis Ramel, whose pleasure in life was to cause destruction to life and property by dynamite, is in jail at Easton, Pa. He had succeeded in wrecking several trains, but by fortunate circumstances no loss of life happened. Train wrecking was preferred to any other line of diabolism, but the wretch admits that he had labored unsuccessfully to blow up hotels and excursion steamers. If the law cannot condemn this criminal to imprisonment for the remainder of his miserable existence, there is something seriously wrong with the law. We have no doubt that every subterfuge which legal chicanery can devise will be used to prevent justice from being awarded to this would-be wholesale murderer.

Boatman's Water Table.

The annexed engraving illustrates a form of water table for locomotive fireboxes, invented by Mr. F. P. Boatman, Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis, and applied to an engine on the Ohio & Mississippi Railway. The distinguishing feature of this from other water tables is that corrugated sheets are employed at the junctions between the table and the main part of the fire box. This overcomes a source of weakness that has frequently led to the abandoning of the use of other water tables. A good water table performs the same functions as a brick arch and has the additional advantage of materially increasing the heating surface of the firebox. But with most water tables the expansion and contraction due to changes of temperature transmitted strains to the connecting sheets which developed cracks. The idea is that the corrugations will prevent this.

The engines having the table in use have been in service for several years and there is no appearance of cracking or other difficulty from the device. The engine is noted for a free steamer and there is said to be considerable saving of fuel effected, but we have not received the exact figures.



BOATMAN'S WATER TABLE.

The Railroad Tramp.

The most contemptible human being to my mind is the tramp of ragged exterior and unclean mien who infests our highways and byways and eats green corn roasted on a fire on the railroad right of way. Being something of a tramp myself, as all railroad supply drummers are, I used to be filled with compassion for the tired vagrant, who could be seen patiently hoofing the ties, as I rode past in the luxurious sleeping car, but that is all past now. I have listened to so many accounts of the depredations done by tramps, that now I abhor the whole fraternity.

My first grudge against tramps arose in this way: One night I was smoking my Clark street Havana before returning to rest in the sleeping car and I had stepped to the ice-water holder to mix my evening soothing tonic, when the car seemed suddenly to go into convulsions. the lid of the water-cooler violently embraced my nose, chaos generally reigned for a few seconds, and then there was silence mixed with groaning and emphatic talk. I collected myself up from under the seat, where I had gracefully retired after my interview with the water-cooler's summit and then I found out that all the excitement had been caused by the train getting ditched.

There was plenty of time to investigate the cause of the accident for we (that is the train) remained faithfully in the ditch all night and most of next day. With one or two others of like inquiring minds, I went back and looked over the place where the wheels had jumped the track first. There were numerous pieces of broken brake beams, débris of trucks and other wreckage lying about. I could not form an opinion in the dark as to how the accident had happened. But toward morning the wrecking train came along and with it the superintendent. He proceeded to the spot also where the wheels left the rails and on his eagle eye observing the wreckage he at once declared it was the work of tramps. I envied the great man his wonderful power of penetrating a mystery, but ridiculous as it may appear I could not help at the moment recalling a silly story I had heard long ago. A great man's fool was traveling on the highway and he picked up a horse-shoe. On meeting another pedestrian the fool held up the piece of iron and said, "What is that?" "Why, you blatant fool," said the man, "that is a horse's shoe, "That is the advantage of being learned", remarked the fool, "for I never would have known that it was not a mare's shoe".

As it was getting to be daylight when the superintendent made his inspection, I noticed that the trackmen had been putting ballast under the track and that there was a sudden descent of about six inches where the wheels jumped the track and that no signal had been out to warn the engineer to run slow. The superintendent, however, settled that a small jump in the track was nothing and that malicious tramps caused the wreck.

Later, when I called at the company's office to ask if there was any atonement they could make to lighten the burden of my broken nose, which promised to be always with me, the president waxed wonderfully eloquent in denouncing tramps, and every time I look in the glass, and realize that my native beauty has gone forever, I mentally record my hatred of tramps and their malicious doings.

While in Indiana lately I happened to be in a town where an inquest was going on, caused by a passenger train running into an open switch and killing an engineer and fireman. A lame attempt was made to show that the switch was left open by the carelessness of a freight crew, the only support of this theory being that the lock was found closed and the switch open. The hind brakeman, however, swore that he closed and locked the switch, and as a tramp had been seen in the neighborhood shortly before the accident it was at once settled that he carried a switch key, and had deliberately unlocked the switch and then closed the lock. Could anything more diabolical be conceived? Could anything more heartrending than the fate of the poor engineer and fireman be imagined? Working their way laboriously towards their happy homes, they rush round a curve where a small switch target cannot be seen till the pilot is almost over the switch rail. An appalling instant, a jerk of the brakes, a crash and two more unfortunates crushed out of existence. No wonder that everybody quails before the responsibility of such dread disasters, and feels relieved at having the friendless tramp to put the blame upon.

SAM SHORT.

The Government Autocrat as a Railroad Man.

Government ownership of railroads is very common in Europe. I think this decidedly objectionable, says Mr. Depew. To form any adequate idea of the autocratic mannerism which the railways of Continental Europe under Government control are managed, it is necessary to personally observe the methods of their administration. To illustrate the character of this autocracy I will relate an incident which I know to be authentic. A party of American students, traveling through Germany, reached a railway station in one of the large cities just as their train was pulling out. An official, seeing that they had started to run after the retreating train with the evident intention of getting aboard, called out to them not to attempt to get on the cars while they were in motion. As the cars were moving slowly they paid no attention to this official warning, and clambered aboard the train. The result of their disobedience of the railroad man's command was that at the next stop they were met by a guard of soldiers, and all marched off under arrest. At first the young Americans treated the whole affair as a huge joke, and inquired, with mock seriousness, when their trial for the heinous offense of jumping on a moving railway train would come off. But they changed their tone on being informed that having deliberately violated an ordinance of the German Empire, they had been already tried, convicted and sentenced to thirty days' imprisonment. In fact, before they realized the gravity of their situation, they found themselves behind iron bars in cells of the city jail, and it required the influence of the American Legation at Berlin, together with the most abject and humiliating apologies on the part of the young men themselves, to effect the release.

Favors Four-Cylinder Compounds.

A well known locomotive designer writing to us about various forms of compound locomotives, says: The simplest form of compound engine and the most mechanical is no doubt the two-cylinder design; but, on the other hand, the four-cylinder compound has many advantages. For instance, there is a certainty of having equal work done on either side of the engine, and therefore less chance of the axles being submitted to undue torsion. My impression as to a four-cylinder compound locomotive is to have the cylinders arranged tandem—that is, with continuous piston rod and valve stem. The increased length would be about 36 inches, which is no great objection. Any increase of width is the greatest drawback. If necessary, a cut-off valve could be arranged for high pressure cylinder. This, I think, would be the simplest form for a four-cylinder compound, guides, cross-head pins, etc., would all remain as they are.

The Litchfield Car and Machine Works are now turning out an order of 427 box cars for the Kansas City, Ft. Scott & Memphis road. All air brakes and patent couplers. Among this number are 100 furniture cars.

The Montreal shops of the Canadian Pacific are working on large orders for passenger and freight cars. Altogether 1,000 freight cars are now being built for the road in the company's shops and by private car companies.

An improvement in car heating has been patented by Robert M. Dixon and assigned to the Safety Car Heating and Lighting Co., of which he is mechanical engineer. It consists of a system of circulating pipes connected with an expansion reservoir, a main system of heat supply in operative connection with the circulation pipes by means of transfer drums, one placed above the other, below the main circulating pipes. The arrangement of the attachments is also embraced in the patent.

Messrs. George W. Passel and John Sofge, of Cincinnati, O., have patented a new mortising machine and assigned all interests in the machine to J. A. Fay & Co., the well known makers of wood-working machinery. The principal claims for the machine are, in a horizontal mortise machine, the combination of a horizontally adjustable work platen, a perforated supporting column extending above and below the limits of tool carriage adjustment, having a guide face approximately in the plane of chisel and angle action, a perforated supporting plate vertically adjustable upon the guide face of said column, a second perforated vertical plate carried in horizontal guides upon the outer face of the supporting plate, provided with mechanism for its automatic reciprocation in said guides, a rotating tool shaft horizontally journaled upon said second plate and provided with an elongated driving-pulley, and driving belt connections extending from said pulley outward through said chisel ram, supporting-plate and guide column.

In Germany some railway trains are lighted very satisfactorily by what is known as the Khotinsky system. Each coach is provided with two distinct storage batteries, and the lamps are arrayed on two distinct circuits, so that in case of accident to one circuit, or during the changing of the batteries, no compartment shall be left entirely without light. The storage cells, which have been specially constructed to stand rough handling and vibrations, have a capacity of 200 ampére-hours at 16 volts and 7 ampéres. Each battery supplies current to four 8-candle-power lamps for the compartments, and one 5-candle-power lamp for the lavatory. The weight of a battery is 700 lbs. The batteries are placed in boxes one at each end of a coach under the floor, and special arrangements are made for rapidly replacing the exhausted batteries by others newly charged. The wiring is on the outside of the coach, and one lamp in each compartment is provided with a switch and the other with a resistance by which its light may be reduced to 2 candle power at the pleasure of the passengers. This light is in use on the line, Fulda-Frankfort, and is being fitted on one of the express trains running between Berlin and Frankfort.

Transportation Buildings at the Columbian Exposition.

We have received from Mr. Willard A. Smith, director of the Department of Transportation of the World's Fair, the annexed engravings showing the fine building that will be devoted to the transportation exhibits. In connection with the illustrations, a circular has been sent out giving to all interested particulars about this department of the Exhibition. The following extracts will be found of interest to our readers:

WORLD'S COLUMBIAN EXPOSITION—DEPARTMENT OF TRANSPORTATION EXHIBITS—FRONT ELEVATION.

PLAN AND SCOPE.

It is the intent of this department that it shall fully and fairly present the origin, growth and development of the various methods of transportation used in all ages and in all parts of the world. As far as possible the means and appliances of barbarous and semi-civilized tribes will be shown by specimen vehicles, trappings and crafts. Past history will be illustrated by relics of the earlier days. It is hoped that in the interest of historical accuracy and the preservation of important relics which are now daily passing away, the attention of the Department of Transportation Exhibits may be called, by its friends in all parts of the world, to exhibits of this kind which may and ought to be secured.

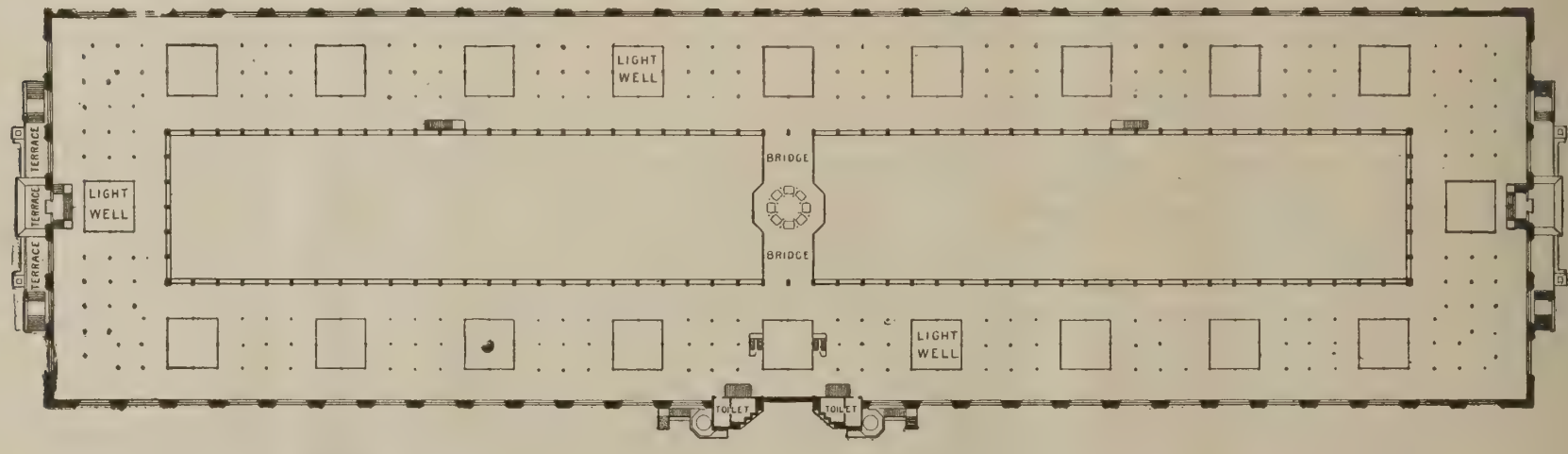
The development of water craft from the crudest forms to the modern ocean steamship; of wheeled vehicles from the first inception of the idea of the wheel to their present seeming perfection, and of that greatest of all means of transportation, the railway, will also be further illustrated by accurate models, drawings, plans and designs in cases where the actual apparatus, appliance or machine itself cannot be exhibited.

It is the desire of this department to keep the historical feature clearly in view, and even to magnify it. By so doing the greatest exhibition of the actual means of transportation employed throughout the world to-day will stand out in high relief by contrast, and the wonderful achievements of recent years will bear more weighty testimony to the genius of the age in which we live.

The classification which is presented herewith is intended to be reasonably full and complete, but not to enumerate by name all possible or probable kinds of exhibits. A careful perusal of it will prove suggestive and helpful to intending exhibitors. It may seem to include some things which it is difficult to show in an exhibition of this kind, but the object kept in view is to make so complete an exposition of the methods and means employed in every branch of the business of transportation, that the earnest student of the science may here find everything at his hand, without encountering the difficulties which now beset and environ such study and investigation. A grand object lesson will be presented so clearly and impressively that a child may learn in hours and days what would otherwise require months and years. But in addition to the object lesson, there will be a gathering of plans, designs, blanks, reports, monographs, literature, and everything appertaining in any way to "methods of abridging distance" such as has never been made before, and such as must have an appreciable effect upon future growth and development. The tendency of such collections and the inevitable comparisons resulting, is to bring the lowest up to the level of the best, and to stimulate to an extraordinary degree both the adoption of the most improved methods and the invention of new means.

THE RAILWAY EXHIBIT.

A space of over eight acres is devoted to this interest. The plan adopted provides for the best possible utilization of space. Exhibitors will have every opportunity for showing their appliances and devices to the best advantage. As far as possible arrangements should be made by joint agreement for showing everything in its proper place and relations. Locomotive appliances can best be shown on locomotives and the appurtenances and furnishings of cars on cars. Specimens of standard permanent way will afford opportunity for showing track materials, tools and all that appertains thereto in the best possible manner. It is believed that nearly all of the establishments engaged in locomotive, car and bridge building will be represented. A large number of the leading railways of the world will also make exhibits of their standard roadbed, track and equipment. The opportunity thus offered for joint action is almost unlimited, and by proper placarding where necessary every exhibit may be given proper prominence. European railway appliances and machinery have never been exhibited on any large scale alongside those used in America. It is hoped that the undoubted influence of this exposition upon railway development in the future great markets of the world for railway material, will be sufficiently appreciated to bring out the desired comparison on a large scale. Abundant and choice space has been designated and reserved for foreign countries, and every possible facility will be afforded foreign exhibitors.



WORLD'S COLUMBIAN EXPOSITION—DEPARTMENT OF TRANSPORTATION EXHIBITS—FLOOR PLAN OF ENTRESOL.

Trouble with a Triple Valve.

A very edifying letter was written to the *Locomotive Engineers' Journal* by Mr. James Hempinstall giving his experience with a triple valve. If more engineers took the intelligent interest displayed by this man in train mechanism, there would be fewer delays caused by brakes working badly. The letter says:

"A few days ago, after the train was unloaded, while putting the empty coaches away, the triple valve became disabled, and before I reached the yard I used the service-stop opening when the brake went on with a jerk, and I could not let them off. I then told the car inspector to shut the cut-out cock and bleed the auxiliary. He said it would not let off then. Finally, after a few minutes, it *leaked* off. I thought this would be a good opportunity to examine the cause of train jerking and brake not releasing. I told the inspector that I would like to assist him in examining the valve. We took out the triple valve, and found the small brass pin which holds the stem of graduating valve to the stem of slide valve was broken and out of place. Not allowing service stop port to open, it kept the air on auxiliary side of piston at full pressure, causing the piston to uncover quick action port, hence jerking the train. We then took the triple valve out of a spare coach and put it in place of the disabled triple, recharged the auxiliary, it taking some time to fill with air. We applied the brake, and it went on all right, but would not release. Here was a new difficulty to look after. We took down the emergency valves and found nothing there. We concluded to examine the triple valve again, and in the bottom of piston chamber lay the small brass pin with its end against the piston, stopping it so as not to allow the exhaust port to open. After removing it the brake worked all right. Thus it shows what a little brass pin, about three-eighths by one-sixteenth inch, has the power of doing. It caused quick action by breaking off of one place and non-release of brake by dropping into another."

What the Man from Tennessee Said.

"Ten years ago," said a Tennessee machinist, "I had a little machine shop, with four journeymen, and 'Sim' for an apprentice. In the spring rains I took a severe cold, and didn't get out of the house for four months. I worried a good deal, for I expected my little struggling business would go to the wall soon, but most of the time I was too sick to think much of the matter. Finally, when I got so as to get out, I wandered down to the shop. Instead of four journeymen I found nine, and Sim was busy in the little 7 × 9 office closing a contract with a rich inventor to build a steam road wagon.

"It seemed to me," said the machinist, "that during my sickness Sim had been in consultation with my wife, and that she, with a woman's intuition, had let him go ahead about as he pleased, and his way—with only his three years' experience—had been a better way than mine. He always had money to pay off Saturday night, and there was a little standing to my credit.

"The old shop had a brighter look than ever before. The windows were clean, and some tons of old junk had gone to my neighbor's foundry in payment for good castings. Sim had ordered a new lathe, fixed up the old engine, lined up the line shaft, and had the floor swept out and the walls whitewashed.

"Sim and I," concluded the narrator, "are partners now, and the only thing I really miss is the little old shop that he made look homelike."—*American Machinist.*

The Patent Tube Expander manufacturod by J. Faessler, of Moberly, Mo., seems to give satisfaction, as he reports that the demand for it in railroad shops is steadily increasing.

The Keith Manufacturing Co., of Sagamore, Mass., report business as being very good. Among their recent orders was one from the Old Colony Railroad for 50 box and 50 60,000-lb. coal cars.

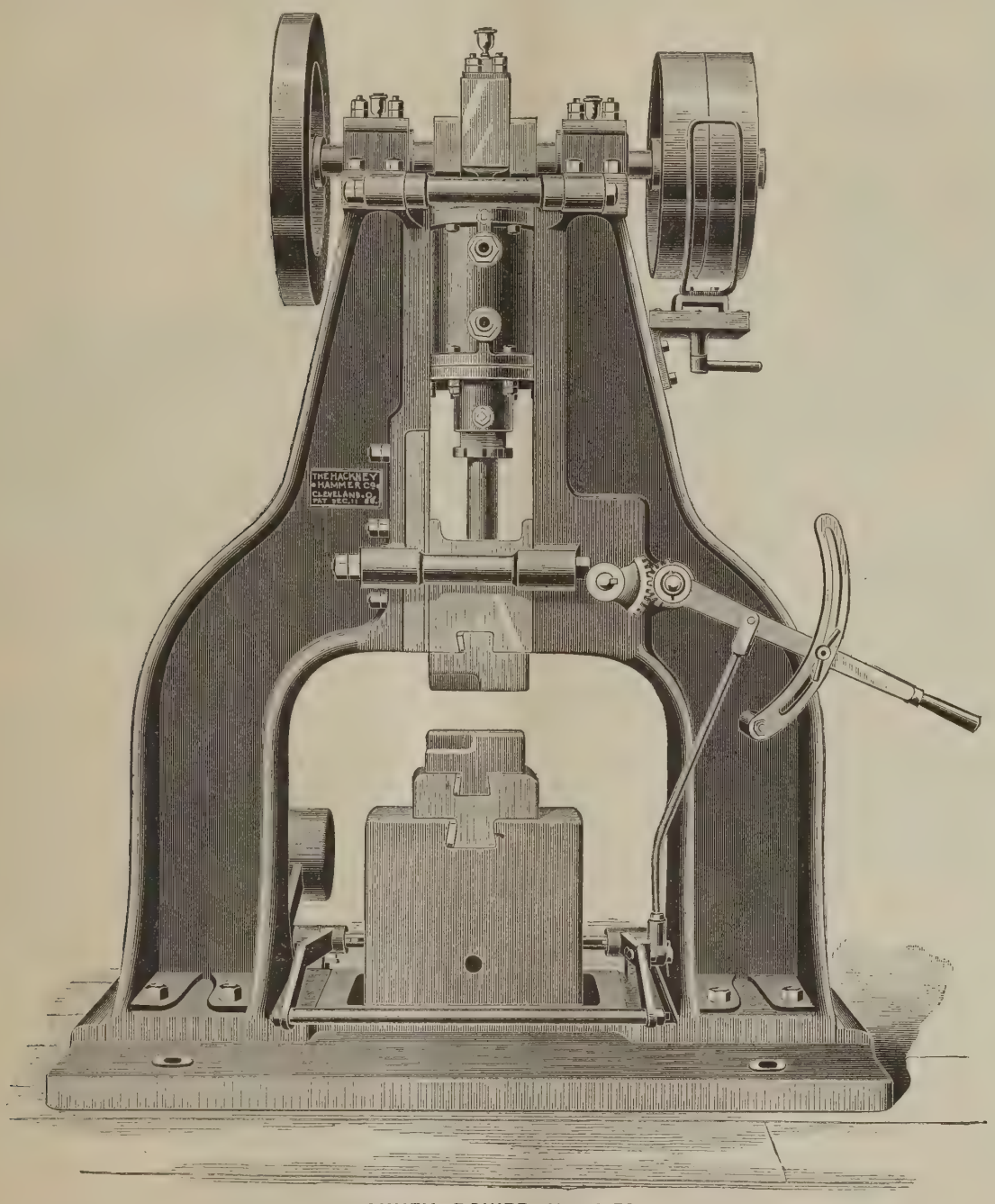
The Hackney Power Hammer.

We here give some illustrations of a new power hammer, which embodies some points of interest to hammer users and mechanics generally. The hammer is of that class known as pneumatic; that is to say, it is driven by a belt, but air is used as a medium by which motion is transmitted to the hammer head, as will be explained further on.

At the top of the standards there is a forged steel crank-shaft working in bearings of phosphor bronze, one on each side of the crank. The crank works in a yoke, having a sliding box of phosphor bronze, this yoke being attached directly to the air cylinder below, which is thus given a vertical reciprocating motion in the slides formed in the standards. Within this cylinder is a piston, which, by the usual rod, is attached to the hammer head, the air, more or less of which is confined above and below the piston, serving to transmit motion to it and to cushion it at the end of each stroke.

The guides for the cylinder and hammer head are adjustable for wear, and can easily be replaced. In the smaller sizes the lower part of the hammer, upon which the die block rests, is made separately, so that it may be easily renewed in case of breakage, while all the larger sizes have separate anvil blocks, which are arranged to rest upon their own foundation, as shown by the outline cut.

The method adopted in the manufacture of these hammers is such as ought to, and, we believe, does secure workmanship of the best character, with all the advantages of interchangeable parts, which can be supplied at short notice. They are regularly built in six sizes, ranging from 50 to 500 pounds, the nominal size of the hammer being the weight of the head, rod and piston. The 50-pound hammer weighs



HACKNEY POWER HAMMER.

The admission and confinement of air in the cylinder is controlled by valves, which may be worked by hand or by foot, as is most convenient. In the larger sizes of hammers there are four valves, two being merely admission valves, which admit air to supply the place of what may be lost in case there is any leakage. This, of course, they accomplish automatically and at each stroke, so that any reasonable amount of leakage does not interfere with the working of the hammer, and the piston and stuffing-box need not be so tight as to interfere with free working. The valves at the back of the cylinder are the ones by which the motion of the hammer is controlled, these valves being opened and closed by means of a sliding wedge, which is connected to the system of levers before referred to. These valves open in reverse directions, so that when one of them is opened by the wedge the other is closed. One valve being closed, or the tension upon the spring which tends to close it being increased by the action of the wedge the air is confined above the piston, which is thereby forced down, the other valve being at the same time opened, so that, until the piston has passed this valve its motion is unimpeded.

It will be understood, however, that the action of the air, its compression, etc., depends upon the relative motions of the piston and cylinder as much as upon the absolute motion of either, while the intensity of the compression, and consequently the force of the blow delivered, depends upon the degree of opening of the valves.

The motion of the hammer is considerably greater than that of the cylinder, and the action of the valves is so prompt and certain that a single blow can be delivered with the maximum force, and the hammer will be arrested and held at the upper end of the stroke by a brake provided for that purpose, which is controlled by the same lever that operates the valves. This enables the hammer to be used for drop forging simply by putting in suitable dies for that purpose, and without any other special preparation whatever.

2,500 pounds; stands 6 feet 2 inches high over all; has 7 inches travel of head; uses dies 5½ inches long. is driven by a 3½-inch belt running on a 10-inch pulley, and will deliver 350 to 380 blows per minute. The 500-pound hammer weighs 14,000 pounds; stands 8 feet 5 inches high over all; has 14 inches travel of head; uses dies 14 inches long; is driven by a belt 5 inches wide running on a pulley 24 inches diameter, and can strike 200 to 250 blows per minute. The hammers are built by the Hackney Hammer Company, Cleveland, O.

Booming Business Outlook.

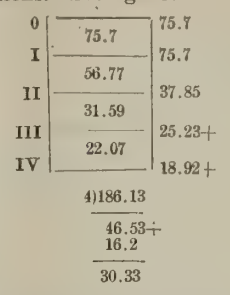
Jay Cooke, the Philadelphia banker, who advanced $20,000,000 on the bonds of the Northern Pacific, and whose failure in September, 1873, precipitated the financial panic of that year, made his first trip on the Northern Pacific last month. Mr. Cooke takes an optimistic view of financial affairs, and while at St. Paul said:

"I look forward to a long term of immense prosperity for the United States. I believe that we are now at the beginning of an era that will mark the advance of our country to the rank of the foremost commercial and financial nation of the world. For years the United States has been drained annually of millions of gold, which was sent abroad to redeem or repurchase the securities, both public and private, which were sold to foreign capitalists in the times of our financial depressions. Ever since the beginning of the war this has been going on. It is now about ended. The United States' indebtedness to Europe has nearly all been paid and the current of money income has set the other way. Hereafter the gold will come to us. The stability during the recent financial crisis is one of the highest proofs that foreigners have every confidence in us. Hereafter every American security will be rated as gilt-edged in foreign financial circles, and I think American securities will be sought after by European investors at much higher prices than now prevail."

Mean Steam Pressure in Cylinder.

The method given below may be found useful when no works on engineering are at hand. It is simple, easy to be remembered and nearly correct.

Construct a rectangle representing the cylinder, divide its length (in this case) into four parts, representing the number of expansions. See figure:



4)186.13

46.53+
16.2

30.33

As in the example given the absolute initial pressure will be 61 + 14.7 = 75.7 pounds = the pressure with which the piston begins its stroke. Place this number at the top of the diagram. The pressure is the same when the piston is at ¼ stroke—the point of cut off; consequently, place the same number opposite division I in diagram.

When the piston arrives at ½ stroke the volume of the steam is doubled, and the pressure, according to a well-known law, is one-half of that at point of cut-off, viz, ½ + 75.7 = 37.85, which place opposite division II.

When the piston reaches ¾ stroke the volume of the steam is trebled, and the pressure is but one-third of that at point of cut-off; ⅓ × 75.7 = 25.23+, which place opposite division III.

So when the piston reaches the end of the stroke, the volume of the steam being quadrupled, the pressure is but one-fourth of that at cut off; ¼ of 75.7 = 18.92+. Place this at the bottom of the diagram, opposite IV.

Now we have a diagram showing the pressures of the steam at five points of the stroke, and it remains to average it for the whole stroke.

The average pressure for space 0—I is, of course, 75.7; that of space I—II is one-half of the sum of 75.7 + 35.85 = 56.77 +; space II—III = one-half of sum of 37.85 + 25.23 = 31.59; space III—IV = one-half of sum of 25.23 + 18.92 = 22.07 +. Adding together the average pressures of the four spaces, and dividing by 4, we have 46.53 as the average pressure for the whole stroke, from which deduct back pressure for non-condensing engine, as in example given 1.5 + 14.7 = 16.2, leaving 46.53—16.2 = 30.33 for the effective average pressure.

This result is slightly in excess of that obtained by hyperbolic logarithms, owing to the few divisions made in the diagram. By multiplying the divisions a closer approximation to the true average may be made.—*George E. Reid in American Machinist.*

The New York, Ontario & Western has discharged eight passenger conductors, The collisions on this road have been so numerous of late that the discharging of some train dispatchers and superintendents would be considered highly seasonable.

The Central Car Rep air and Manufacturing Company, which recently took possession of the Whitely Reaper Works, at Springfield, O., has a number of strong railroad men interested, and has a capital of $500,000. It will be several weeks before the works will be in operation.

The officers of the Long Island Railroad have been lately receiving well merited abuse from the New York papers owing to an accident for which some of these are responsible. Two years ago a watchman connected with the railroad mysteriously disappeared, and his wife believed that he had fallen into an open well on the company's premises but the railroad people pretended to deride the idea and refused to permit the well to be searched. The poor woman went to work to support her large family, and lately she died worn out by hardship and mental distress. About the time of her death some neighbors more influential than the poor widow interested themselves in the case, and compelled the railroad people to search the well, where the lost man was found at the bottom. Thus the fertilizers for the growth of ante-railroad sentiment are lavishly spread.

Three different railroad companies using Luttgen's variable exhaust damper have intimated that the use of the damper results in prolonging the life of the flues.

The Henry Patent Car Seat, manufactured by the Wakefield Rattan Co., of Boston, is steadily gaining in popularity. Quite a number of railroads have them now in use.

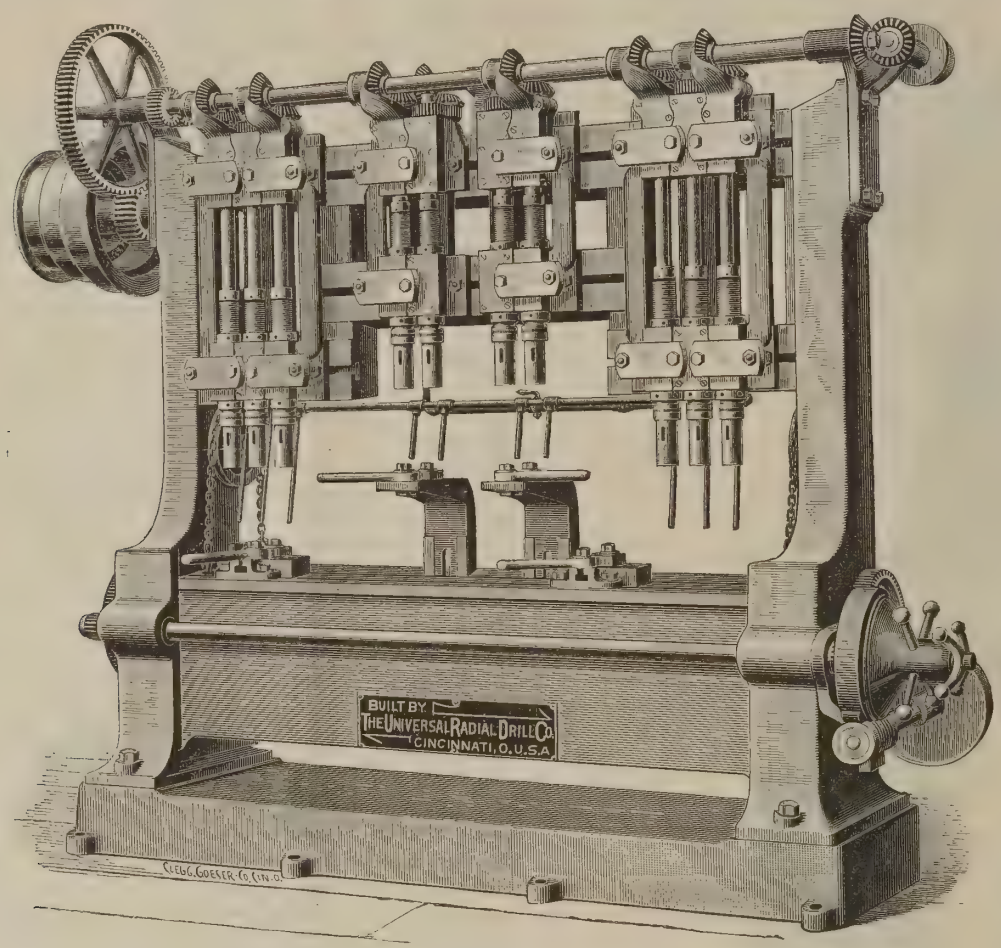
Messrs. Burns, Silver & Co., manufacturers of car hardware, Bridgeport, Conn., are kept busy in the manufacture of their specialties. They have recently put a very extensive addition to their factory and employ about 100 men.

The De-Oxidized Metal Co., of Bridgeport, Conn., manufacturers of de-oxidized bronze for journal bearings and car trimmings, report that their business is steadily increasing and that they have done more this year than ever before.

The five story brick building that the Berry & Orton Co., of Philadelphia, Pa., is putting up so as to have better facilities for building their wood-working tools for car shops, etc., is nearing completion. They expect to have it ready some time in October.

Arch Bar Drill.

Illustration is of ten-spindle machine, but it can be furnished with six or eight spindles. All spindles are driven simultaneously by a three-step cone carrying a four-inch belt; the driving shaft is strongly geared. All spindles have a lateral adjustment without disturbing driving gears, and all spindles run in one direction and can be closed up to drill to centers of four inches; the spindle sleeves are threaded outside and are adjustable vertically four inches, by means of lock nuts to compensate for differences in length of drills. Spindles are provided with vulcanized fibre thrust washers and check nuts for taking up wear of collars. The work table feeds upward by means of rack and pinions, belt driven, and has a quick return movement by hand, and is also counterbalanced. The feed table is provided with two saddle blocks, adjustable horizontally, and also two supports for the arch of car truck frames, and the latter are adjustable vertically to suit different heights; these saddles and supports have steel faced back stops or jaws (the same being adjustable to suit different widths of arch bars) and the clamping is done by the four levers shown, they being cam shaped and revolving about a steel bushed stud. The cooling solution is piped to each spindle from one reservoir. Weight about 11,000 pounds. The tool is made by the Universal Radial Drill Company, Cincinnati, O.



ARCH BAR DRILL.

The Swelling of Steel.

It is well known that steel or iron will swell more or less when heated, but it is not so well known that this property can be made use of to good advantage at times. The crank pin of an engine had been turned a trifle too small, so that the fit could not be depended on if put in in the usual way. The crank pin was small, so the loss would not have been great if it had been thrown away, but they were in a hurry for the engine and the time that would be lost was of more consequence than the price of a new crank pin, but it was thought that they could save it by utilizing the swelling property of the steel. The crank pin was heated a trifle and the surface covered with soap to prevent scaling, after which it was heated a little more, but not enough to redden it or raise a scale. After soaking at this heat for a while it was cooled off and found to have swelled nearly enough to make a good driving fit. Another heating was given it. It was then found to have swelled all that was required and a little more than was necessary. The pin was then put into the lathe and the surface polished. The crank was heated and expanded by the heat of a gasoline blowpipe and the pin pushed into place; then both crank and pin were cooled down, and the job was found to be as good as though a new pin had been fitted. The job lasted for over two years and how much longer is not known.—*Stationary Engineer.*

The Madison Car Company, of Madison, Ill., will start work about the beginning of this month. They have already received orders for the building of about 2,000 freight cars.

On Sept. 10 the Chicago, Burlington & Quincy let contracts for 2,000 freight cars and 30 passenger coaches. The coaches went to the St. Charles Car Company, the freight cars being divided equally between the Missouri Car and Foundry Company and the Madison Car Company, each getting 1,000. All these freight cars are to have air brakes and patent couplers.

Fine Electric Lighting Plant.

We have received from the Westinghouse Engine Co., Pittsburgh, a handsome illustration of a fine electric lighting station at Allegheny, Pa. There are six 100 H P boilers used for steam making and they are all provided with the Rooney Automatic Stokers. The power for the plant is supplied by two compound Westinghouse engines and one simple engine of that make.

After a thorough personal inspection of the different systems operated in the larger cities of the United States, the City Councils of Allegheny, have incorporated all the points of advantage of each in their own, and have in consequence a very compact and efficient station.

It is essentially Westinghouse throughout, and consists of a series of independent units, any one of which may act as a reserve without interfering with the operation of the others. This is probably the only plan of arrangement that would permit the concentration of so much power and capacity for lighting in so small a space.

To Solder Glass and Porcelain Tubes to Metal.

For this operation those parts of the glass or porcelain which are to be soldered with a layer of metallic platinum on which is electro-deposited a coating of copper. The *modus operandi*, which is very simple, is to slightly heat the surfaces, and then paint them over with thoroughly neutral platinum chloride mixed with essential oil of camomile. The piece is then again slightly heated, until the fragrant white fumes are driven off; the temperature is next raised to a dull red, by which means the platinum is reduced, and forms a metallic film perfectly adhering to the glass. The work is then attached to the negative pole of a battery of convenient strength, and placed in a bath of copper sulphate. This deposits on the platinum a ring of copper, which, if the operation is carefully performed, will be tough, and thoroughly adherent. In this condition the tube may be soldered by means of tin to iron, copper, bronze, platinum or any other metal susceptible of soldering by tin. The solidity and strength of the joint are very great.

Silverizing may be substituted for platinizing in this process, when the glass is painted with silver nitrate, the other operations remaining the same. The silver so applied unites well with the glass, but a considerable number of tests show that in the majority of cases the use of platinum is preferable to that of silver.

We have received Poor's Directory of Railway Officials. It is for sale for $2 and is in every respect the same publication as last year.

The Taylor Iron and Steel Company, of Highbridge, N. J. have succeeded to the property and business of the Taylor Iron Works. They are the owners of the Hadfield process of making steel castings, and have a capital stock of one million dollars.

Messrs. Bryant & Barbey, of Boston, Mass., have met with success beyond their expectations in the introduction of their rail saw for cutting rails, so much so that they are making arrangements for increased accommodation for their manufacture to enable them to keep up with their orders.

The Consolidated Car Heating Company, of Albany, report an excellent and increasing business, with shops in Canada and the United States running full force. Since June 1, 1891, the beginning of their year, they have received orders for 384 car equipments, 56 locomotive equipments, 6,152 steam couplers. These appliances go to all the principal roads of the North American Continent. The Vanderbilt and connecting lines are removing the Martin and substituting the Sewall Steam Coupler on all cars and locomotives.

People anxious to learn as much as possible about brake shoes should send to the Congdon Brake Shoe Company, Chicago, for their handsomely illustrated catalogues of the various kinds of brake shoes in use. Long experience in investigating the best material and design for brake shoes has made the men at the head of the company experts on the subject, and they have put into the catalogue valuable information that the most observing of railroad men would be years in finding out for themselves, even if their multiplicity of duties gave them time for investigating brake shoes. Take the shortest road to knowledge and send for the catalogues. They are given without money and without price.

The Hale & Kilburn new perfected car seat seems to have captured everything in sight, recently. The Pennsylvania Company are replacing their old seats with this new one, and it has now been adopted as standard by the Pennsylvania Railroad. It is specified on the thirty new Burlington coaches. It goes in the new coaches on the Chicago & Eastern Illinois, also on the Southern Pacific, Grand Trunk, and many other roads. Of course their patented rattan seating keeps up its usual average. They go on the Eastern Illinois Suburban, the Chicago & Northern Pacific Suburban' and on the Chicago Elevated, etc. Young Canman seems to be playing ball.

We have received from the Van Dorston Cushioned Iron & Railway Supply Company a circular respecting car couplers which gives valuable information to those interested in the subject. Among other things the circular says: The adoption of the "Cushioned Carrier Iron" means economy with increased dividends and a security against accidents, and its recommendation by any well-regulated railway company is positive proof that the Golden Spike has been driven by one blow with prudence and good management. We will give to any trunk line, or to any two systems desiring to unite their interests, a special rate which will be at bed-rock terms, who are first on the list to make application for a trial lot (which will be furnished and delivered free of charge, consisting of a five-car equipment) and recommend the same for adoption upon their respective railways.

"The E. Albro Co. Veneer Cutting and Band Saw Mills, of Cincinnati, O., are now very busy executing the numerous orders received in August and September. The business of this extensive concern is a very good index to the trade in hardwood lumber and veneers consumed by cabinet makers, builders, etc., as their business extends all over the United States. They were shipping last week a number of car loads of Mexican and Cuban mahogany, and also several car loads of prima vera (white mahogany), which is now coming into very general use. A visit to the extensive mills of this company is interesting at any time, where one may see all the various processes by which timber is converted by means of saws and knives into veneers and lumber. The E. D. Albro Co. import cabinet woods from all parts of the world, and likewise do a large export trade in their special productions."

Baker Car Heaters for England.

The Baker Heater Co., of this city, have just shipped six of their latest improved Baker car heaters, fitted in cars built by the Gilbert Car Manufacturing Company, for the South Eastern Railway of London, England.

Our Directory.

Bellaire, Zanesville & Cincinnati.—James K. Geddes has been appointed general manager, vice W. R. Crumpton resigned.

Chicago & Erie.—T. A. Lawes has been appointed master mechanic, vice R. F. Kredell resigned.

Denver & Rio Grande.—D. H. Moffat, president, and S. T. Smith, general manager, have resigned.

Fort Worth & Rio Grande.—R. F. Whalen, master mechanic, has resigned. His successor is Chas. H. Burke.

Monterey & Mexican Gulf. — C. A. Merrian has been appointed general superintendent.

New York & New England.—E. M. Humstone has been appointed superintendent of motive power, vice A. Griggs resigned.

Ohio Valley.—J. B. Echols has been appointed general manager. W. J. Torrence, master mechanic, has resigned.

St. Louis, Alton & Terre Haute.—J. W. Stoke has been appointed master machanic, vice P. H. Murphy resigned.

St. Louis Bridge & Tunnel Co.—H. M. Smith has been appointed master mechanic.

St. Louis Southwestern.—F. Inglis has been appointed master mechanic, vice R. M. Galbraith resigned.

Terminal Railroad Association of St. Louis—H. M. Smith has been appointed master mechanic, vice J. F. Sechler resigned.

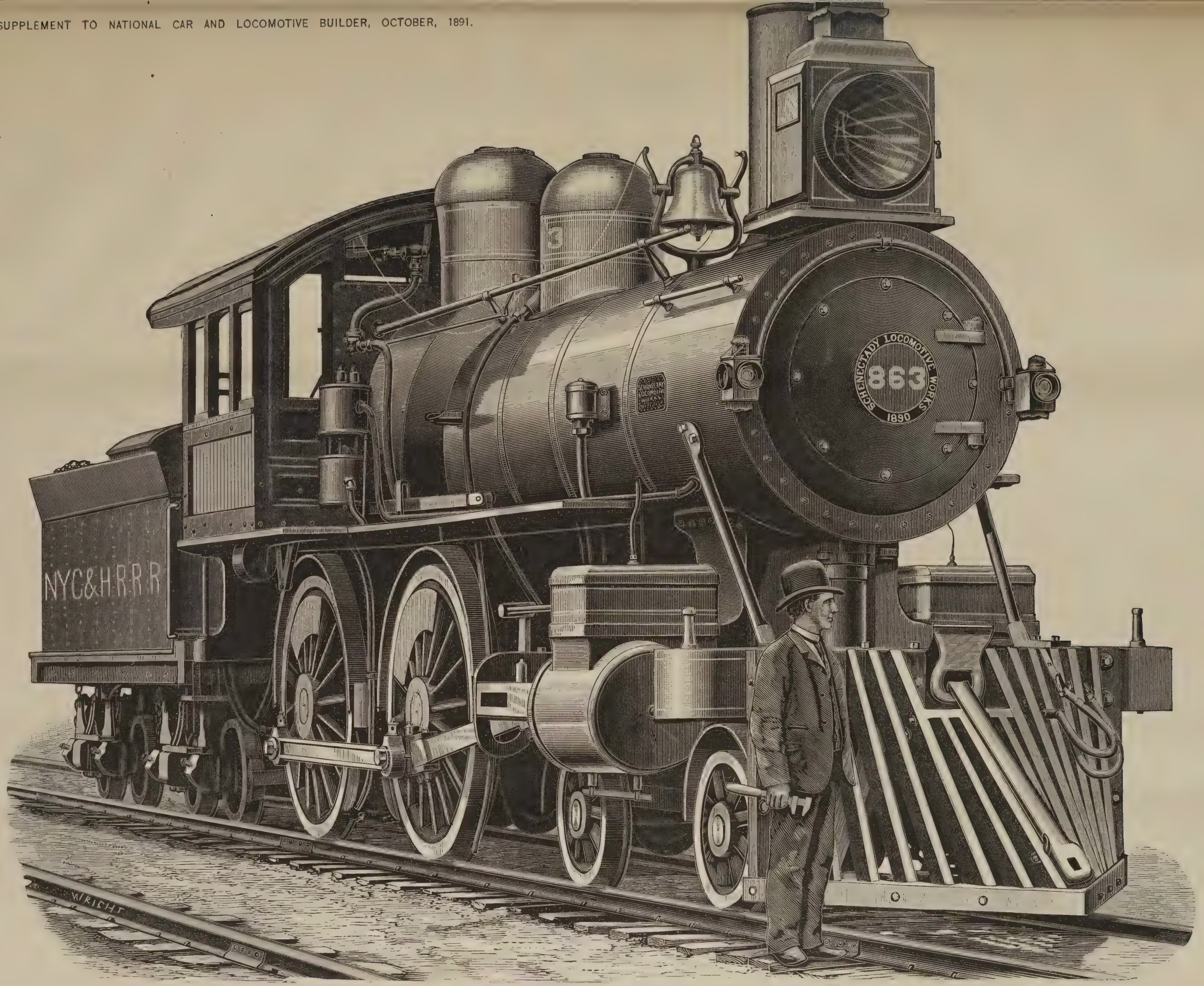
Texas & Pacific.—A. S. Douglas has been appointed Superintendent Motive Power.

Union Pacific.—R. W. Baxter has been appointed Superintendent of the Wyoming division, vice E. E. Wurtele resigned.

Wanted.

Mechanical Engineer.—With 12 years practical experience, who has successfully filled important positions in large manufacturing concerns, is open for engagement; experienced in machine designing in modern machine-shop methods, duplicate manufacture, steam plant erection and testing and in the handling of men; also thoroughly familiar with account of costs, estimating and general management. Address M. E., care this office.

Wanted.—Situation as sales agent, resident or traveling, by a gentleman of several years experience in service of large concern in railway trade. Track equipment preferred. References strictly first class. Address Business, National Car and Locomotive Builder, New York.



NEW YORK CENTRAL'S FAST PASSENGER LOCOMOTIVE.

Designed by William Buchanan, Superintendent of Motive Power.

NATIONAL CAR AND LOCOMOTIVE BUILDER

NOVEMBER, 1891.

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The Brooks Locomotive Works have received an order for 35 locomotives from the Lake Shore.

The Lake Erie & Western has ordered 12 moguls from the Brooks Locomotive Works.

The Rhode Island Locomotive Works have received an order for 25 engines from the Boston & Albany.

The Lake Shore Company is having 30 new locomotives built, to be delivered within the next four months.

The Philadelphia Northeastern Elevated road is receiving bids for building about 160 cars for its elevated road.

The Chicago & Eastern Illinois Company has just let contracts for 700 new cars. Three hundred of them are to be coal cars.

The Cooke Locomotive Works are engaged in building a lot of eight-wheel engines for the Chicago, St. Paul and Kansas City.

The Rhode Island Locomotive Works are building six locomotives for the Chicago, Milwaukee & St. Paul road, some of them 10-wheelers.

There was a fire in the Richmond Locomotive Works last month, but it was extinguished without doing enough damage to cause delay in the works.

The boiler of a locomotive belonging to the Chicago, St. Paul & Kansas City exploded last month, fatally injuring three men. The crownsheet collapsing was the primary course of the explosion.

A series of changes have been made in the mechanical department of the Boston & Maine Railroad, lately, which put the affairs of the car department of the various division shops in charge of the master mechanics.

The locomotive belonging to the Chicago & Alton, to which a new smoke preventing device was applied by Mr. A. R. Cavner, did not steam freely enough to work satisfactorily, and the apparatus has all been taken off.

The plant of the Jones Car Company, at West Troy, N. Y., is to be increased by a large addition. This will double the capacity of the works, which are now overtaxed. The new plant will be in readiness for use by spring.

The Schenectady Locomotive Works are busy on an order of 50 locomotives for the New York Central. There are 20 eight-wheelers, some of them with driving wheels 78 inches in diameter; there are 11 suburban passenger engines and 19 freight moguls.

The New York, Lake Erie & Western has ordered five compound decapods from the Baldwin Locomotive Works. The total weight of each will be 177,000 pounds. The cylinders will be of the Vauclain compound type, 16 inches and 27 inches × 28 inches stroke.

The Baldwin Locomotive Works have completed a compound condensing steam motor for street railroads. It is built with the Vauclain cylinders and has an air condenser. A recent trial proved beyond doubt the success of the machine, and the condenser worked as well as could be desired.

The Michigan Central is now building in the shops at St. Thomas, Ont., 20 60,000-pound freight cars equipped with air brakes. As fast as the old 24,000-pound cars are worn out they are replaced with the 60,000-pound cars, and the air brake is applied on every car that is more than 30 feet long that goes out of the shops.

There was a very interesting exhibit at the Conductors' Fair at New Haven, Conn., last month of the Pintsch system of lighting. It attracted a great deal of attention and there were almost constantly to be seen a swarm of railroad men listening to the explanations of how the system worked, which were very patiently repeated by Mr. St. John, who was in charge.

The Manitou & Pike's Peak Railroad has ordered from the Baldwin Locomotive Works a new locomotive with the Abt system of track gear for use next season. The locomotive will have the Vauclain compound cylinders and several modifications to remove difficulties which had been found in the operation of such large engines at slow speed. These difficulties pertain generally to the steadiness of the train.

A train wrecker, who was captured on Sept. 14, just after the failure of an attempt to wreck a train on the Fort Wayne road, a few miles east of Chicago, was sentenced just a week later to imprisonment in the penitentiary for 10 years. "Railroading" criminals is not always to be commended, but where a villain is caught red-handed in the attempt to commit such a terrible crime as train wrecking, the vengeance of the law should be as swift as it is severe.

An improvement in the casting of steel car wheels has been patented by William G. Richards, of Boston. It consists in the forming of the mold with top vents arranged in two sets, one being over the hub and the other over the rim. In pouring the metal the mold overflows first at the hub. This is automatically checked, and an impetus is given to the metal causing it to flow with increased force toward the rim, which is thus formed of unusually solid material.

At the annual meeting of Pullman's Palace Car Company, Oct. 15, it was voted to increase the capital stock 20 per cent., which will make the capitalization $30,000,000. The new stock is to be offered to stockholders at par, in proportion to their holdings. The earnings of the company, both from sleeping car service and from the manufacturing department, show gratifying improvement. The assets of this great company have reached the immense sum of $45,654,676.

DR. NORTON, the Commissioner of Railroads and Telegraphs in the State of Ohio, has been making tests of the oil used in lighting cars running through that state. The law requires that it shall stand a flash test of 300 degrees. He found that many of the oils used would ignite at 120. The question raised by officers of the Pennsylvania lines whether or not cars lighted by Pintsch gas would comply with the Ohio law was referred to Dr. Norton. After investigating the method of manufacture of the gas, and the qualities of the product, he recommends and encourages its use as being cleaner and safer than oil.

There is likely to be a strong patent controversy over methods of connecting motors to the axles of street and other railway cars. We pointed out a year ago how some one might reap a rich reward in these connections, so arranged as to be noiseless, durable and vary the speed and power to suit grades. The Westinghouse Electric Company seems just now to be ahead, having recently made contracts in Boston for car motors, because of the superiority of their system of gearing. It is a mechanical problem, mainly, but involving peculiar conditions of use in the way of dust, adjustment, noise, room and durability under these conditions.

Those who expect to recover damages from railroad companies in case of accident had better not follow the practice of riding in baggage cars, which is very common on the local trains of some railroads. In case of a collision which turns trunks and other hard hitting baggage into missiles that break limbs like pipe stems, the courts have held that the passenger who puts himself within reach of that danger is guilty of contributory negligence. Should he, however, be injured by the car getting smashed the railroad company is liable for the damage done. This decision was given in a law suit lately and illustrates the refinement of legal discernment.

For some days past the Big Four people have been testing their new 10-wheel freight engines with surprising results on the road between Union and Galion, where are the heaviest grades. One of these engines hauled 35 loaded cars from Galion to Union, using but six tons and a half of coal, while one of the company's mogul engines, hauling 27 cars, consumed 10 tons of coal. It was claimed by the mechanical engineer who prepared the plans and specifications of these engines that they would haul the same tonnage of an ordinary freight engine with a saving of 33 per cent. in coal, and the tests have shown even better results. —*St. Louis Republic.*

The Western car famine is being more severely felt and railroad men confess that already they are unable to handle the freight offering. At the office of the general freight agent for the Pennsylvania lines west of Pittsburgh, it was stated: "When the corn crop comes in and lake navigation closes we will find the car famine a much more serious matter than at present. At present we are getting along just comfortably, but we have no cars to supply the demand of Western and Northwestern roads, as we usually do. With the enormous crops in the West, and the present prospects for foreign demand, the railroads will certainly be taxed to provide equipments as they never have been before. The pressure west of Chicago at present is greater than it is in the East, and they are worse crippled for transportation equipments than we are."

The new Pittsburgh & Western pay car, which is being constructed at the company's Allegheny shops, will be a model of convenience. It will not be a large car, being only 37 feet in length, but it will contain sleeping accommodations for six or seven men, observation facilities, and the pay department proper. The latter will be so designed that the employés, when they are receiving their wages, will pass into one door and out another, both opening onto the same platform. This will obviate crowding. The observation end will contain the usual low windows, affording a full view of the track, and will be used by President Roberts and General Manager Patton when the occasion requires, more especially on the narrow-gauge division, where the "Youngstown" cannot pass over the numerous curves. The car will not be completed for several weeks yet.

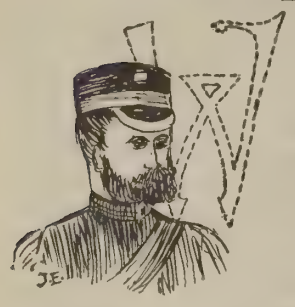
At the last meeting of the Southwestern Railway Club there was a rather interesting discussion on the Best Form of Draught Gear for Freight Cars. As a large percentage of the total cost of repairs to freight cars is expended on the draught gear, anything that can be devised to reduce this expense is important to railroad companies. The American Continuous Draught Gear was highly commended by some of the speakers, and others favored that device in combination with the Butler drawbar attachments. While there was diversity of opinion as to the particular attachments that would render the most satisfactory service in preventing damage to draught gear, all agreed that appliances performing the functions of continuous drawbars and draught timber protectors like the Butler attachment, were necessary to meet the severe service that heavy cars, heavy locomotives and bad braking induce.

The Pullman Palace Car Co. (works at Pullman, Ill.) are about completing an order, aggregating 61 passenger and baggage cars and 9,550 box and gondola cars, for the Philadelphia & Reading Railroad Company. It is reputed to be the largest order of passenger and freight cars ever contracted under the inspection of one man in this country. The Philadelphia & Reading Railroad Company seem well pleased with the equipment. A notable feature in the construction of these cars is the fact that in one day the Pullman Palace Car Co. turned out 76 cars, averaging one every eight or nine minutes. Mr. W. E. Jones, of Reading, Pa., an attaché of the road, has, "single-handed and alone," not only supervised but inspected all the details of this great work, and has been both zealous and faithful in the discharge of his duties. He has borne his burden of responsibility with signal ability, and merits the award of the company's appreciation and esteem.

The annual meeting of the American Society of Mechanical Engineers will be held in New York City, beginning Nov. 16. The proceedings usually consist of the reading of papers on engineering subjects and discussions regarding the same. Topical questions are also discussed. Among those in the latter department that have some interest for railroad engineers are: Has any one ever tried to standardize sizes for keys? If so, what are his sizes? What is the best form of cylinder lubricator for engines carrying 140 pounds of steam pressure or over? Why should any one cut a half-inch bolt with 12 threads to the inch? Is there any objection to the U. S. standard of 13 threads? Have you any facts to show that there is molecular change in metals when their temperature is raised or lowered? Have you had any experience with systems for purification of bad feed water before it gets into a steam boiler, either by precipitation or otherwise?

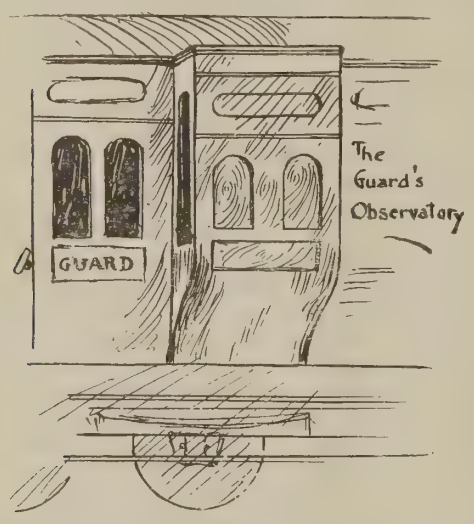
From far away Central City, Col., we have received an illustrated catalogue of Thurston's automatic pneumatic railway car coupling and air systems. The principal figure in the illustrations is a portrait of F. W. Thurston, the inventor of the apparatus, and then comes a three verse lyric about bees, spiders, webs, threads and waxen cups that do not inebriate, after which come some engravings whose principal purpose appears to be not to show anything in particular. There appears to be more than a full share of pneumatics about the invention. Intimation is given that on receipt of certain stamps a circular giving description and price list of drawings will be sent at owner's risk, showing full details of new fast railway system for the 19th century. Electrotypes will also be sent at certain rates. The apparatus appears to be a combined brake, car coupler and signal, an impractical combination which is remarkable principally for the cheek displayed by the proprietor.

In an English Railway Carriage.



WHEN for the first time, as a free but imported American, says James Eagen, in *New York Railroad Men*, to which we are indebted for the accompanying illustrations, the writer put his foot within an English railway carriage (first with the natural curiosity of a newly landed stranger in a land of tips, searching the depths of the eyes of the porter who opened the door for him, to see if any appeal for a tip lurked therein), he was possessed of the magnanimous resolve to see good in all that pertained to the English railroad; to find lessons in its curious couplings and sermons in its wooden wheels. The first test of his magnanimity came when the guard had slammed the door and the train had started. The compartment contained, in addition to the writer, two men and one woman and her two children. The children were a host in themselves, and made things lively for the American during the best part of what seemed to be over an hour. They yelled, and they climbed, and they scrambled, and they tried to get out of the windows, and to open the doors, and to push away from the window the American who was enjoying the exquisite rural pictures flying by him, and they did everything but keep still, and thus at the very outset of his proposed broadminded pilgrimage, the annoyed Yankee found himself wishing that he was in an American car, where he could flee to a quiet back seat and enjoy the scenery undisturbed. He had heard Englishmen deliver dissertations on the privacy of the compartment system, but concluded that if this was a sample, riding in a Harlem train on a Saturday afternoon was solid solitude compared with it.

As the children finally condescended to go to sleep on the seat, the writer had a chance to consider the situation, and he then remembered what a late English writer (Ackworth) said about English railway carriages, and appreciated the situation accordingly. Here is what Mr. Ackworth solemnly proclaimed in his "Railways of England" "The truth is—and however difficult it may be for the Americans to believe the fact it is undoubtedly the truth—that

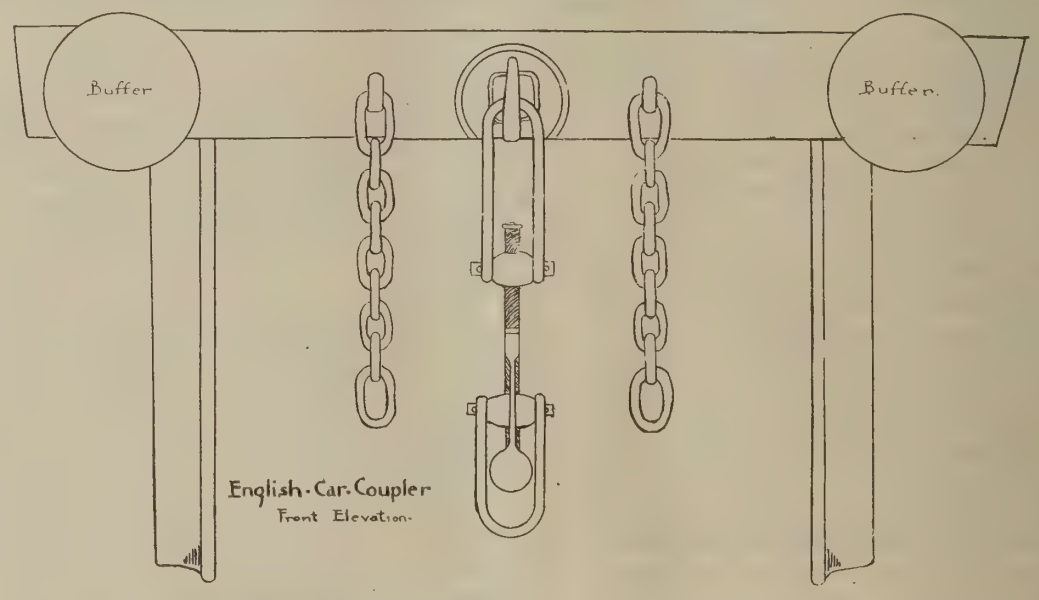


we maintain in England our 'lonesome stuffy compartments' simply because we like them. For my part, I can honestly say, after a good deal of experience of both kinds of locomotion, that I would rather be 'boxed' up in a Midland third-class than have the privilege of enjoying the conversation of the general public in the most luxurious car that Pullman ever fashioned. I would go further, and say that, strange as it may seem to gentlemen who are so delicately nurtured that it makes them uncomfortable to hear that other people are deprived of access to a lavatory for three whole hours, to me the loss of that inestimable boon would be cheaply purchased by the certainty that for three whole hours one is safely locked in and protected from babies who squall, and the babies of larger growth who whistle and drum upon the window panes."

So far as whistling on window panes is concerned, the present writer must confess that he never met any one in America who ever performed such a strange antic, either for three hours or three seconds, but he has had experience in an English compartment, not only with the baby who squalled, but with the comfortable and well-to-do old couple who scattered bread crumbs over the seats and filled the compartment with the odor of the butter and whiskey they absorbed, and there was no escape from it either, unless you put your head out of the window and risked having your hair blown off or getting a cinder in your eye. But these little incidents of railway travel in England do not bother a man, especially if he has no lady friend or relatives with him and is grimly determined to be charitable. A man would be an angel indeed if he could refrain from making comparisons as he traveled; but to reduce this tendency to a minimum, it is intended in the present article not to enter into a discussion of the comparative merits of the English and American car systems, only so far as such comparisons are suggested by the description of what we would consider odd features of an English railway carriage.

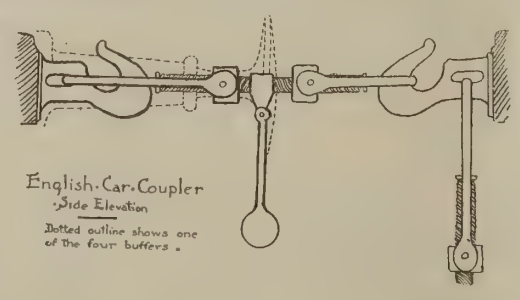
The English railway carriage has been so often described that it may seem superfluous to give a description here, but it is noticeable that writers on the subject in most cases bestow their attention on the greater points, so to speak, of the equipment and operation of the rolling stock, and fail to give any account of the many small details which would make the picture less general and more clear to the mind's eye of the reader. A person from reading very much may think he is well acquainted with an English railway carriage; but when he sees one, and has thrust upon his attention its thousands and one interesting details, he feels that in one short hour he has obtained a closer knowledge of his subject than stacks of books would give.

The exterior of the average English car, as a rule, is, to an American, as pleasing as it is unique. The colors are generally dark and harmoniously blended, and the finish is like that on a coach body, so that no joints are visible. No battens or matched boards are used as in American cars. The cars as a rule are much shorter than the shortest American car, for the reason that the many side entrances make impossible the use of the stout angle bracing which goes from each end to the center of the long American car. The most modern cars, however, are of considerable length, the one shown in the illustration being 56 feet long. This car is also distinguished by having six-wheel trucks, the average English car having only four-wheel, and some of the older and shorter cars only two-wheel trucks. No cast wheels are used, and in the new cars one sees more 42-inch wheels than 36-inch wheels. The Man-



sell wheel with steel tires and wood center is very extensively used, the wood being of well seasoned teak, in about 16 pieces, put in under tremendous pressure, and kept in place by the center plate and a retaining ring keyed in the tire. Elliptical and semi-elliptical springs are used almost exclusively on the trucks.

To the American who is accustomed to automatic couplers, the hand couplers used on the English cars seem strange and antique. Two illustrations are here given of the coupler most used. When coupling is to be done a man gets between the cars, throws the free link of one car over the hook on the next car, and then gives the lever with the ball on the end several turns, thus bringing the cars closer together, and causing the four buffers to exert a steady pressure on each other. Additional chains are sometimes attached. Between the buffers and the coup-



lings the train of short cars is thus kept rigid, yet pliable. The Westinghouse air brake hose, which runs up the back of the car about 6 feet from the ground, instead of straight out from under the platform, as in American cars, must also be coupled. When the man has finished coupling he has to dodge under the buffers in order to get out, and in this way many men get maimed and killed.

The average measurements of the interior of a first class compartment are: length, 6½ feet; breadth, 7½ feet; height, 7 feet. The floors are carpeted, and the seats, which are covered with the dark blue cloth used in coaches, are heavily cushioned, and have padded backs which extend above the head. Above the padding, on each side of the compartment, a light rack for luggage runs the width of the car, and sometimes the space under the rack is filled with narrow frames, similar to those in use on American horse cars, containing advertisements of hotels or photographs of scenery on the route. There are three windows on each side of the compartment, one in the door and one alongside each seat. The window in the door is let down with a strap just like a carriage door window, but the other windows are set permanently in the car frame, and are immovable. When the windows are all shut, ventilation is obtained from a sliding gridiron ventilator above each door. The lower part of the doors are padded. In smoking compartments leather is generally used for the seats and door padding. Pintsch gas fixtures, in a plain glass bowl set in the ceiling, are the means by which light is furnished at night. As the average Englishman does not hire sleeping accommodation when on a night journey, but camps out on the seats, the railway company, with great thoughtfulness, makes his slumber a little more certain by providing him with a means for extinguishing the light, that is both simple and novel. Screwed to the ceiling, close to the glass bowl containing the light, is a brass arm, one end of which is pivoted vertically in the ceiling and the other holds a brass hoop. To the hoop is attached a thick, green baize bag, and this combination butterfly net and nightcap the tired traveler shoves over the glass bowl, thus squelching the light and producing a grateful darkness which is, at least, some little help toward slumber, even if the traveler does, sometimes, have to sit upright with legs tangled up with the legs of the man opposite. With a little practice, and with the help of a comparatively strong constitution, one can obtain a pretty large slice of slumber on the journey and feel all right in the morning. He won't get a chance to wash his face until he gets to his destination, unless he is on one of the modern cars now being run by the London & Northwestern Railway and the Midland Railway, in which case he can perform his ablutions with thoroughness and comfort, in the combination lavatories and toilet rooms, which are shown on the floor plan in our full page illustration.

The lack of lavatories on English cars always has been, and is now, one of the greatest inconveniences of the system, and one of the most unaccountable bits of clinging to traditional usages that the comfort-loving English people have perpetrated. Mr. Ackworth, in the extract from the book given at the beginning of this article, pretends to like this sort of thing, and throwing a metaphorical shillaleh into the air, dares you to tread on the tail of his coat, for, though "he might have been a Rooshian, or French, or Turk, or Prooshian—he remains an Englishman" and defends the inconveniences because they are his. When a train is scheduled to stop a few extra minutes at a way station there is a slamming open of a score of doors, and a mad rush of a small regiment of masculine passengers in the direction of the station lavatories, and a return rush with a large proportion of the passengers adjusting their clothing as they come. But progressive roads like the London & Northwestern are changing all that, and the full page illustration shows how they are trying to solve the problem. The lavatories there shown opened directly out of the compartment, and contained a wash basin, water closet, mirror, towels, and a glass water bottle and tumbler. It was a little larger than the water closet on an ordinary American passenger car. The washbasin was made of white metal, and was ingeniously shut up against the wall. When it was pulled down it was seen to consist of a tray and basin in one piece, kept horizontal by two curved arms which came out of slots on either side where the basin had been shut up, and the water was furnished by a faucet in the niche in which the basin reposed when shut up. The whole arrangement was ingenious, and made the best possible use of the space at command. The serious objection to the lavatory as a whole, is that it is used by both sexes of passengers, and as it opens directly out of the compartment, its use is sometimes attended with considerable embarrassment. This defect has been obviated by the Great Northern Railway of England, which has built cars similar to the Wagner stateroom cars in use on the New York Central, in which a lavatory is placed in each end of the car, and connected by a corridor running along one side of the car. The corridor is entered from the outside by doors placed opposite each compartment, so that one

may enter the compartment from the outside, by crossing the corridor while the compartments, separated as before, are also entered from the outside door as usual. The first-class compartment universally used is supposed to carry six to eight passengers, and the second and third-class, eight to 10. Some of the second and third-class compartments have painted under the luggage rack, on each side, the inscription, "Seats for five passengers," thus making 10 the full complement. The car shown in the illustration seats 16 first-class and 28 third-class passengers.

The second-class compartments, so far as the writer was able to judge, were just as good in accommodations but not in fittings, as the first-class. The third class compartments on roads like the London & North Western, and on the Midland were really very good, the woodwork and upholstery not being quite so fine as in the first and second-classes. This, in connection with the fact that there is no particularly high social atmosphere in it, as in a first-class compartment, might make a dude feel uncomfortable there, but the rides are generally short, the scenery you see from the windows is just as exquisitely beautiful as that you see from a first-class window, and you have considerably more money left in your pocket, than if you had gone in for style in a first-class compartment. If you are not wealthy, and are a philosopher, and cannot obtain a pass in a first-class compartment, you will travel third-class and be happy. On the London & North Western particularly, the third-class compartments are so good, that most English people travel in them. At the third-class window of the "booking office" in Euston Station in London (and a "booking office" is a window where you buy a

ticket to your destination, and don't do any "booking" at all) the American will always find a line of well dressed, and apparently well-to-do people waiting to buy their tickets, when the first and second-class windows are deserted. The unfailing instinct of the American who desires comfort and respectable company, is to locate himself where he sees a comparatively good plug hat. He will find plenty of good plug hats in a third-class compartment.

Having thus taken a good view of our train, we wait for it to start. A huge dinner bell stands on a block outside the station, and the station man or guard takes it up and rings it vigorously for a few seconds. The passengers all get in, and then a porter comes along and shuts all the doors that have been left open. The guard, who wears a neat blue uniform, shoulder belt and leather pouch, and a cap whose peak is bound with a flat strip of brass half an inch wide, waves his hand. There is a shrill but pleasant toot from the engine's tiny whistle, and the train moves out easily and with a surprisingly small amount of noise. Pretty soon houses, trees and bridges fly by with what might be called "great slickness," and you realize that you are traveling in one of the easiest riding cars you were ever in. If you are a railroad man, you will then become interested in the roadbed, the rails, the springs and the wheels, and get a few ideas of the thoroughness with which those things are looked after by the English railroad men. The guard is not seen again until the next station. He is busy in his van, attending to a multitude of duties which want of space forbids us here to describe. He watches the road in most instances from a little bay-window in his van, and if he has occasion to jerk the bell rope, which runs under the eaves outside the cars on one side of the trains, he can do so with a full view of the road.

The Englishman tells you that he likes the compartment system because of its privacy, and you will notice, when you have traveled in England, that he does his level best to get all the privacy he can lay his hands on. Sometimes, in violation of the rules, he tips the guard, and then the tipper gets into the compartment and sits there in solitary grandeur, while the tippee informs the other less wealthy passengers, who are also looking for that privacy which knows not the existence of the grown up baby who "whistles on the window pane," that the compartment is filled. The writer saw another successful but more economical device put into operation, and narrates it here for the benefit of engaged couples, or newly married or other married couples with a hankering after privacy. It was a typical English couple, well advanced in years, who put the scheme into operation. They came to the compartment in which the writer and another gentleman had located themselves. They distributed their load of luggage over all the seats, and then the old man made his wife stand up in the doorway. Many people came, and seeing the seats all filled with luggage, and not caring to ask the old lady to step aside, passed on. When the train started the luggage was put in the rack overhead, and the four people congratulated themselves on having so much room in which to stretch themselves. It was a great scheme, and the next best thing to tipping the guard or a porter. It also showed the advantage of possessing a wife in England.

So far as privacy was concerned, the writer found that he was brought face to face and into greater personal contact with more people in an English compartment than he ever was in an American car. Their personality is as much thrust upon you in a compartment as in a coach upon the street. What this close communion brings you to, is seen in the following notice in English, posted in one of the cars running between Calais and Paris:

"Passengers are especially Cautioned not to play Cards with strangers in the Trains. If they do, there is little doubt that they will be cheated and robbed, as the persons who invite them to play may be professional Card Sharpers of the worst character."

The above notice is a rather eloquent reminder of one of the defects of the compartment system. In winter the compartments are not heated, but a flat can of hot water on which to put your feet is used. This seems and is a rough and primitive way to make a winter traveler comfortable, and is generally ascribed to the fact that steam would make a small compartment too warm, and to the conservatism of the English. In this connection a New York paper illustrating the desire of the English for home comforts, perpetrates the following squib:

English Lord (in American palace car)—"Fetch me a can of hot watah an' me rug." Porter—"Dis car am heated by steam, sah." English Lord—"Turn off the heat an' fetch me a can of hot watah an' me rug."

But this exaggerated conservatism does not any longer exist in England, for there are many evidences that changes and modifications in the compartment and other systems are slowly but surely being made. And so the world moves. The English are adopting American ideas and the Americans are adopting English ideas, and the consequence is the two peoples are gradually bringing their railroads near the same standard. The American who travels in England fifty years hence will note many changes in the railroads, but he will find the English railroad man just the same as he is to-day, very whole-souled, but very entertaining.

Railroad Superintendents' Convention.

The annual convention of the Society of Railroad Superintendents was held last month in New York. President H. Stanley Goodwin was in the chair. There were 35 members present.

Several changes relating to membership were made in the constitution. The report of the Executive Committee showed the finances to be in a satisfactory condition. The secretary's report showed a membership of 198, representing 111 railroads and 90,000 miles. The secretary recommended the more active encouragement of associate membership, suggesting that much valuable talent might be brought into the association in this way. He also suggested further consideration of the plan of awarding annual prizes for papers, as was done two years ago with satisfactory results. The secretary has had correspondence during the year with the Master Mechanics', Master Car Builders', Roadmasters' and Train Dispatchers' associations. Messrs. Mackie and Graves, of the latter, were in attendance at the meeting, and told of their action in suggesting alterations in the standard code to the American Railway Association.

There were short discussions on train rules and on spikes.

The committee on machinery reported on malleable iron in car construction and on car heating. The latter report referred principally to what has been done on the New York, New Haven & Hartford, which has equipped 200 passenger train cars with the heating system of the New York Safety Car Heating and Lighting Company, 350 cars with the Consolidated Car Heating Company's system and 50 cars with the Leland heater. The cost, in addition to the cost of the regular Baker system, is $165 per car. Steam for heating cars at terminals is obtained from a variety of sources; from shop boilers, from boilers used to heat station buildings, by special boilers, and in two cases from a gas or electric light company. The inspector of air brakes has been put in charge of the heating system and he is engaged in instructing the trainmen. The officers of this road say an effective regulator for controlling the degree of heat in the cars is still an important desideratum.

In the election of officers C. W. Bradley, West Shore, was chosen First Vice-President and G. W. Beach, N. Y., N. H. & H., Second Vice-President; and for members of the Executive Committee for two years, Messrs. R. G. Fleming, S. F. & W., and O. M. Shepard, N. Y., N. H. & H.

Mr. Willard A. Smith, Director of Transportation Exhibits of the World's Columbian Exposition, addressed the meeting on the plans and prospects of that enterprise, giving a general outline of what is to be done and asking the co-operation of railroad officers. Mr. Smith emphasized the fact that many valuable relics of the old days of railroading in this country are being destroyed and lost, and urged upon the members the importance, from a historical point of view, of stopping this carelessness. Mr. Smith was chosen an honorary member of the association, and the executive committee was directed to take up the matters presented by him.

Mr. W. G Wattson, Division Superintendent of the West Shore, read an interesting paper on "Economy in Train Service." In the discussion which followed on this subject, Major R. M. Sully (Richmond & Petersburg) moved that the Committee on Transportation "devote its time during the coming year" to the preparation of a catechism for the examination of employees (trainmen). The motion was carried.

The president appointed as a committee on signalling J. J. Turner, P. C. C. & St. L.; James Donnelly, Lehigh Valley; C. H. Platt, Grand Central Station; J. H. French, Old Colony; C. D. Hammond, Delaware & Hudson; W. G. Watson, West Shore; O. E. McClellan, Pennsylvania. It does not appear whether this is the standing committee provided for earlier in the meeting.

A dinner of the society was held in the evening, at which the president was in the chair. He was ably assisted by Vice-President Bradley, whose principal duties were the inducing of members of the company to make speeches. He succeeded admirably. The programme was to have an informal meeting, and no one appeared to know that he would be asked to speak until his name was called. The members showed wonderful ability in making amusing impromptu speeches. Some one remarked that their practice of jacking up men on short notice had cultivated the talent of impromptu speaking.

Tuscan Red vs. Car Yellow for Railway Coach Painting.

Great is the diversity of opinion of car painters as to what color is best adapted for painting the exterior of railway coaches.

Master Car Painter Jones will tell us that no color equals the light yellow standard car body color, while Master Painter Smith cannot understand how a man with ordinary common sense and fair knowledge of car painting can tolerate any other color but the Pullman standard car body color. Master Painter Brush favors Tuscan red, etc. Although not professing to be a high authority on this subject, the writer feels justified, after a number of years of practical experience at car painting, in casting our vote in favor of Tuscan red.

The superiority of Tuscan red over the standard yellow car body color may be summed up as follows:

In preparing a coach for painting yellow, it is necessary, to insure best results, to have the groundwork very near the shade of the finishing coats; this necessitates the use of a light-colored, rough coating or rough stuff, as this is the ground over which the body color proper is applied. In using a light-colored rough stuff, it is necessary to apply a coat of a dark-colored thin mixture (mixed flat) over the last rough coat, as a gauge coat, so that the rubbers in rubbing down the rough coat with pumice stone and water, to procure a smooth surface, may know when it has been sufficiently rubbed. Some painters will probably say that this gauge coat is unnecessary, but note the fact that it is practiced by the majority of them. When the gauge coat has been completely scoured off with pumice stone and water, the surface should be—after sandpapering lightly and dusting—in proper condition to receive the body color. At least three coats of the yellow car body color will be required to produce a moderately well covered job, and we believe the majority of painters give four or five coats. As the average mechanic cannot stripe nor ornament over this flat surface without leaving his "ear marks" in the form of finger imprints, owing to its delicate shade, the last coat of color must be mixed with rubbing varnish, in painter's parlance—a "color and varnish coat."

This color and varnish coat when dry is rubbed with pulverized pumice stone and water, with a piece of felt, until the surface is flattened or deadened sufficiently to stripe and not have the gold leaf used to gild stripes adhere to the body of the car in places where it is not wanted, which it would do if the surface was anyways glossy. The car is then ready for ornamenting and striping.

Now, a word as to Tuscan red. In coating a car with Tuscan red, a great deal of the above labor is saved. Any colored roughstuff may be used for surfacing under Tuscan red, but the dark umber-colored roughstuff is universally used. This does not require a gauge coat over the last coat of roughstuff. Being a dark color it requires very little experience to tell when it has received sufficient rubbing, consequently the material and labor of applying the gauge coat—necessary in using the car yellow—is saved by using Tuscan red. The best Tuscan red will cover solidly with two coats; car yellow requires three to five coats. Lettering and ornamenting can be done over flat Tuscan red without showing finger prints of the workmen; car yellow must necessarily have a coat of color and varnish in order to avoid this, as we have previously stated; and the propriety of applying rubbing varnish to the exterior of railway coaches has long been questioned by car painters who aim to secure durability, claiming, and we believe justly, that coaches varnished with finishing varnish only are less liable to crack and will wear longer than those on which rubbing varnish is used for first coats.

To sum up the whole subject matter, we find that Tuscan red will produce as good results as the car yellow with from two to three coats less material, is certainly as attractive as a color, is easier to match in touching up, and harmonizes with almost any color used in connection with it. At some future date we hope to be able to say something in reference to their respective wearing qualities.—*Tuscan in Painting and Decorating.*

Exhibit of Hall Signals.

The railway conductors held a fair last month in the armory at New Haven, at which a great many interesting exhibits of railroad appliances were on view. An exhibit that excited very great attention was that of the Hall Signal Company, of New York. The automatic block signal system which this company had in operation on the Boston & Albany, the New York, New Haven & Hartford, and other lines, was shown in operation on a reduced scale by a model track, a full equipment of signals of small size, and cars that illustrated the working of the system. The Hall signal system, as most of our readers know, protects the railroad track where it is in operation by means of signals actuated by electricity and operated by the wheels of passing trains. When a train or any other obstruction is on the portion of track within a certain circuit the signals stand at danger through the breakage of the electric current that keeps them at clear when the track is unobstructed. At the New Haven fair a section of double track was shown protected by absolute block signals, and the same system was also shown as it is used for the movement of trains on a single track and the methods employed for thoroughly protecting them. In addition to these there were crossing alarm signals in operation, and the various other signaling and interlocking appliances made and controlled by the company were on exhibition.

New Haven was a peculiarly good location for an exhibit of the Hall signal system, for it is in use on the principal railroad running into the town, and all the trainmen belonging to the road were familiar with its working. All day long and throughout each evening crowds of people stood over the exhibit and watched the movement of a car make the signals go through the life-like operations which can do so much to increase the safety of train movement. There were always plenty of trainmen ready to explain the *modus operandi* of the signals to their less enlightened friends and acquaintances. A track circuit was used, and the normal position of the signals was danger. As the vehicle representing a train approached the beginning of a block, the signals turned to clear to admit the train, and then held the signals to danger until the block was passed. A part of the object lesson of the exhibit was to show that the signals could not be made to show clear when any train or car was on the block, or when anything was wrong with the track.

The practical working of this system always enables the engineer to see the signals changing from danger to clear as he approaches them. As he rushes along through the weary watches of a stormy night, there is no fear of mistaking a lamp in a farm house window for the signal of safety. He sees from afar the familiar red eye and he knows that if all is well it will turn to white when he reaches a certain point. If it remains red a stop is imperative. On a well managed road the signals keep changing from red to white as the train approaches, and the recurring changes are to the engineer like the revolving or flashing light of a pilot at sea—the harbinger of safety. This is the ideal way of moving trains safely. When the American public get educated to the point of understanding what an automatic signal system means, there will be as little patience shown to the roads that fail to provide this provision for securing safety as there now is for those which neglect to put automatic brakes on their passenger trains. A. S.

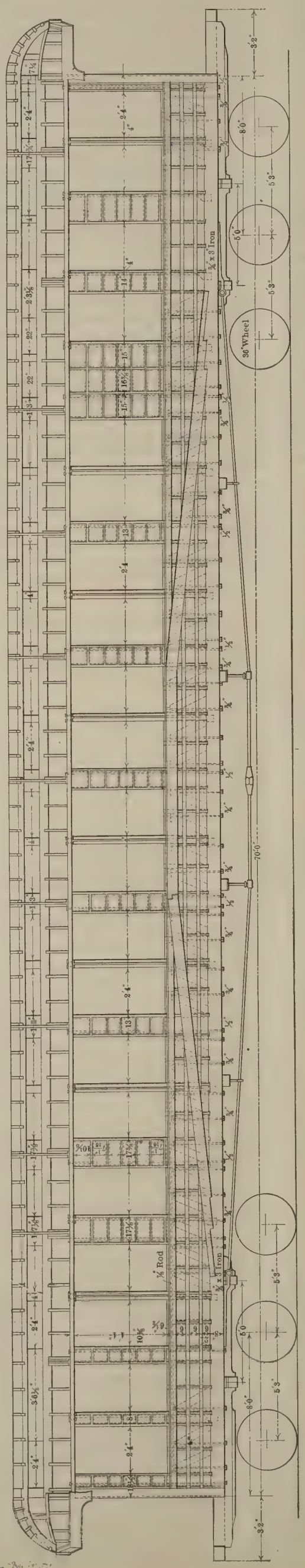
Railroad Machinery for Brazil.

The Bureau of American Republics is informed that since the promulgation of the reciprocity treaty with Brazil 128 locomotives have been sold in that Republic by the Baldwin Locomotive Works of Philadelphia, and in addition to this number 24 locomotives are now being loaded at Philadelphia for Brazil on the barkentines "Maggie Thompson" and "Eleanor M. Williams." Under the reciprocity treaty with Brazil locomotives and railroad supplies generally from the United States are admitted free of customs duty.

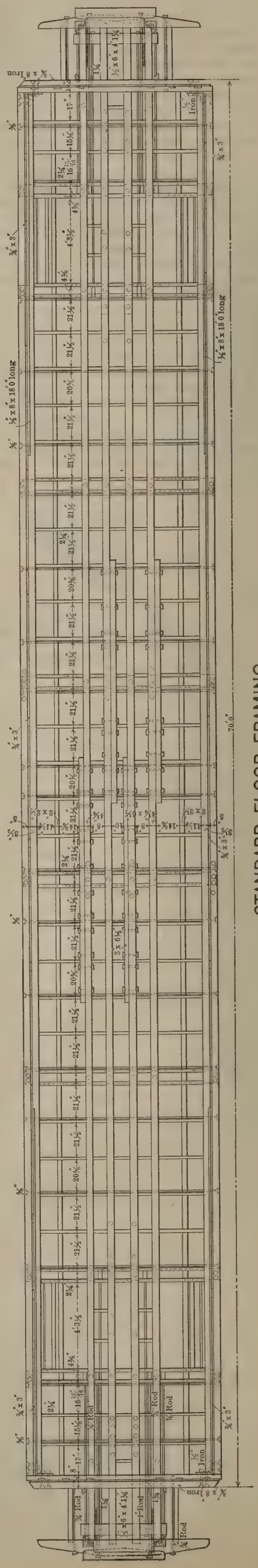
The Brazilians have always preferred American locomotives, and our sale of both locomotives and rolling stock will probably be greatly increased in the future by the reciprocity treaty. During the four montns from April 1, when the treaty went into effect, to Aug. 1, our exports of machinery to Brazil were valued at $874,104 as against $214,821 during the same period in 1890, and our exports of carriages and cars increased from $229,891 to $348,545. These were on the free list. Among goods on which there is a reduction of 25 per cent., when manufactured in the United States, the exports of hardware and tools increased from $56,466 to $88,205; and lumber and wood manufactured increased from $107,678 in 1890 to $320,776 this year. This shows an increase on the four items above mentioned of $1,058,774, or nearly 174 per cent.

General Manager Ramsey, of the Cincinnati, Wabash & Michigan, offers a handsome reward for the detection of the person who has been maliciously throwing switches on the line, causing much damage to equipment. An ex-employé of the road suggests that it would be well to put new locks on exposed switches, so many keys are held by former employés on the road.

WAGNER PALACE CAR COMPANY.



STANDARD BODY FRAMING.

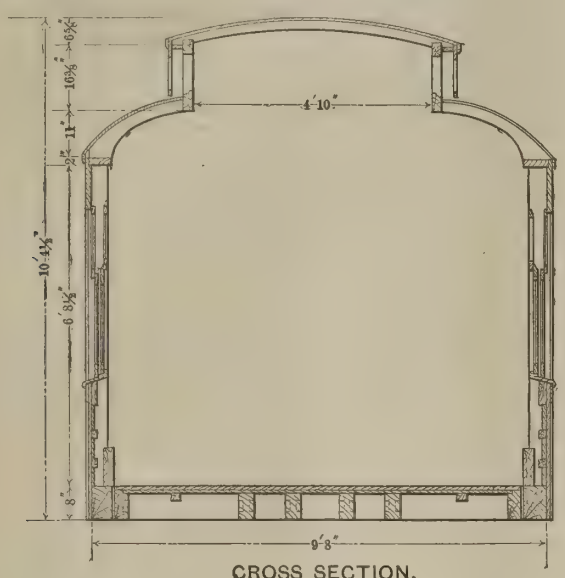


STANDARD FLOOR FRAMING.

Wagner's Latest Palace Cars

The annexed engravings, those on page 166, and our supplement give illustrations of the latest style of palace car built at the Wagner Car Works, Buffalo. Among cars of this pattern lately built are the Ipswich, Ingomar, Inkerman, Inverness, Meacham Lake and Placid Lake.

The main saloon is elaborately decorated, bringing into play the most effective devices of architectural, mural and relief decorations. The bulkhead of this apartment is treated harmoniously, the development springing from a richly decorated base supported by pilasters carrying an arch and frieze of conventional foliage decoration, spirited almost into life by artistically carved figures. This frieze is a pronounced featnre of artistic design and workmanship, covering a space of about 10 square feet and carved in select mahogany.



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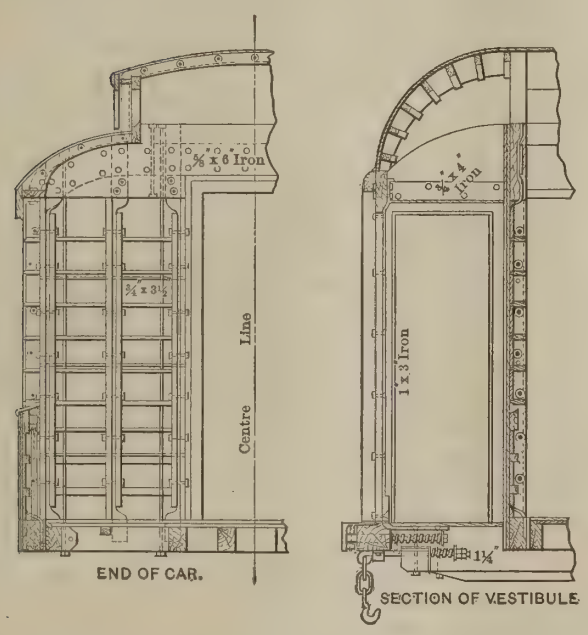

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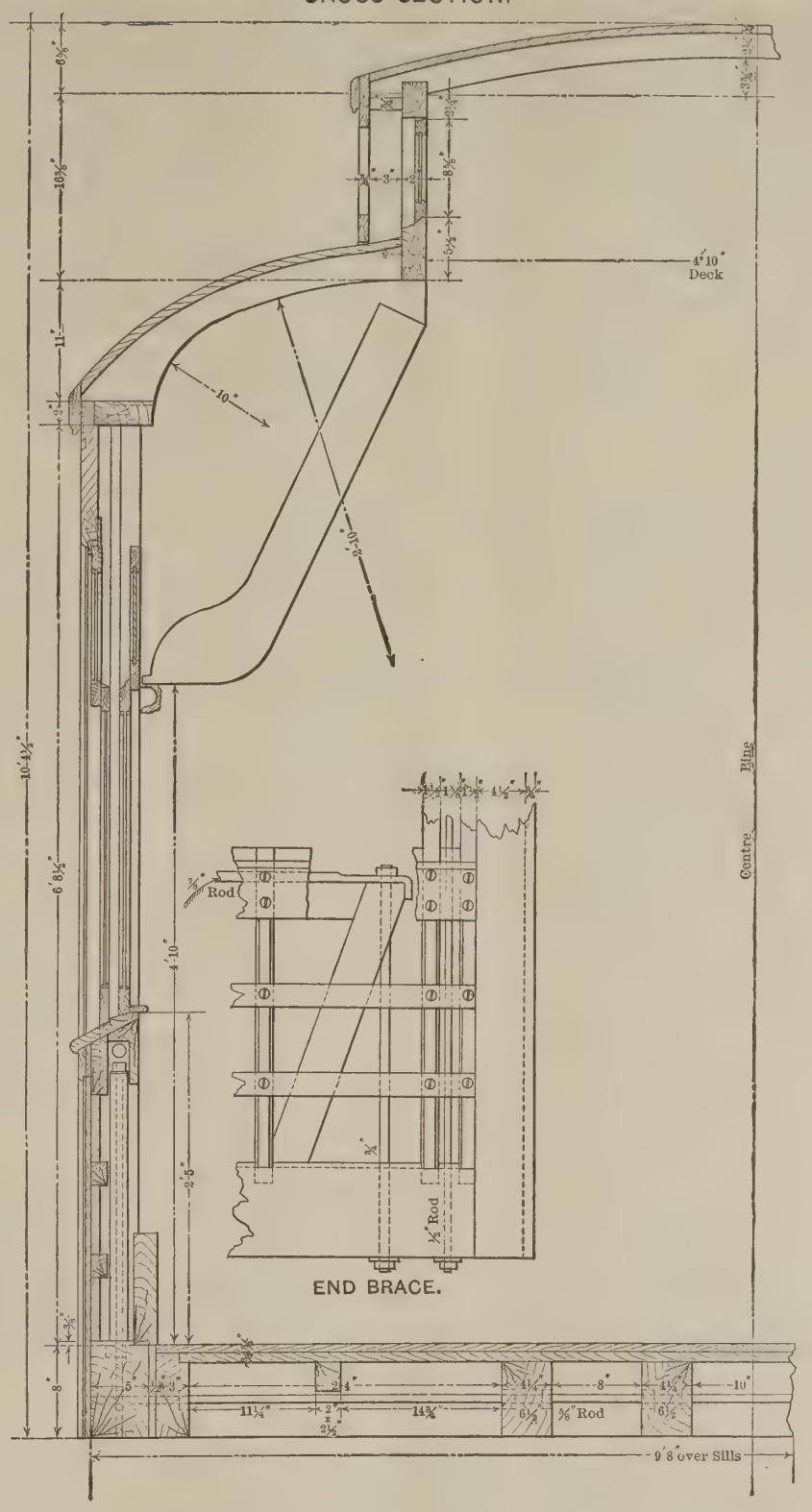

WAGNER PALACE CAR.

The seats, the backs of which strongly suggest the Roman antique chair, are happily conceived and most suitable to the comforts—covered with mohair plush, the color in unison with the deck linings, treated in rich relief and stencil, and the richly carpeted floors. This entire apartment is finished in the most select figured San Domingo mahogany.

Passing the handsome portiere, and opposite the main room, is the stateroom, even more elaborate than the main room, covered with carvings and harmonious in its splendor of draperies and upholstering. This room is developed in that beautiful French style Louis XVI., and forms a most suggestive abode of luxurious indolence.

Passing along a corridor, as it were, of selected mahogany, at the end of which the smoking room is reached, also in select mahogany, resplendent in mirrors with brass frames, portieres and select carvings of the antique school.

These cars are over seventy feet long, and promise to become the standard palaces of railroad traffic.

In our supplement wood engravings are given showing the exterior appearance of the sleeping car and the interior of both the sleeper and a chair car for day travel.

Air Brake Practice.

At the September meeting of the Western Railway Club Mr. G. W. Rhodes read a paper on "Air Brake Practice." It consisted principally of criticisms of the report on "Care of Air Brakes" submitted by a joint committee to the last convention of the Master Car Builders' and Master Mechanics' associations.

The first item taken up was the recommendation that employés connected with the care or operating of air brakes should be examined as to their knowledge of the apparatus, and a certificate of competency given when men are found worthy of it. This proposal was severely assailed, principally on the ground that men holding such certificates would treasure them after they had forgotten the knowledge that the certificate testified to. He considered that the practice of giving certificates for competency respecting brakes would be the entering wedge to calling for certificates for competency on other branches of railroad work. He considered also that legal complications would arise from employing men who did not hold certificates.

The proposed limit of piston travel was objected to. In place of the figures 4 and 8, the author of the paper recommended 6 and 9 inches as the minimum and maximum travel. The principal objection raised to the short minimum travel was that the piston would sometimes fail to cover the leakage groove and that losses of air would result.

In the instruction to engineers which calls for the brakes being applied before starting and held on till all the brakes are inspected, Mr. Rhodes proposed making an amendment, requiring the engineer to apply the brakes by exhausting all the air out of the train pipe. The purpose of this change is to enable the engineer to judge of the length of the train by the quantity of air that has to be exhausted. It would also prevent cars with sluggish working triple valves from being cut out.

When directions are given about stopping trains only partly equipped with air brakes, the proposal is made to require the engineer to permit the cars to take up slack before applying the brakes, instead of the directions to the effect that great care must be used and to apply the brakes with only from 6 to 8 pounds reduction till the slack is taken up.

The paragraph that advises the engineer to release brakes just before coming to a dead stop to prevent reaction shocks, is said to require amendment. In the case of a mixed train this would not be good practice, and would lead to breaking in two if hand brakes were set at the back end of the train.

After the directions given for cutting out the brakes of a car that are not in working order, the author suggests adding directions to leave the bleed cock of the auxiliary reservoir open.

In the case of stoppage through a burst hose, directions are given to test the brakes of the train after the deficit is remedied. An amendment is proposed requiring the trainmen to proceed to a safe place before delaying to test the brakes

An addition is proposed to the directions for draining the reservoirs calling for the train pipe under the tender to be blown out thoroughly before being coupled to a train.

A few more trifling changes were recommended.

Mr. J. N. Barr proposed that the paper be discussed at next meeting, and it was decided to invite air brake experts to be present and take part in the discussion.

Mr. John Mackenzie did not see any objection to giving men certificates of proficiency in acquantance with brakes. The possession of a certificate of proficiency did not guarantee a man a position.

Mr. J. H. Setchel favored examining the men periodically to ascertain that they keep posted.

Mr. W. H. Lewis considered as good the recommendation to increase the minimum travel to 5 inches.

Mr. Barr considered that the greatest stress should be laid on maintaining an average travel of say 8 inches. He held that with a piston traveling from 4 to 10 inches, there will be great difficulty in releasing brakes on account of the varying pressure behind the triple valve.

Mr. Rhodes gave a variety of reasons favoring the practice of exhausting all the air out of the train pipe when testing the brakes. He also emphasized the necessity for letting the slack take up before applying the brakes on trains partly equipped with air. The various recommendations of the paper were explained and arguments made in favor of their adoption.

There was some slight discussion by various members, but no important point was made.

Comparisons of Westinghouse Air and Vacuum Automatic Brakes.

The government of New South Wales having decided that power brakes must be applied to the freight equipment of the railways, a competitive trial was made last April, which resulted in the Westinghouse air brake being selected. The trials were made before a Board of Experts, of which D. H. Neale was a member. The experience which Mr. Neale had with the airbrake trials at Burlington, made him the best posted man in the commission. In a report which he submitted to the Railroad Commission, there are several valuable points made about different kinds of brakes. The following are a few selections from the report which we regret is too long for our columns:

To stop a long train in the shortest possible distance, a brake must have three essential qualifications: 1. Quickness of application; 2, ample power alway available, and 3, sufficient range of action to take up the wear of brake blocks.

(The report tended to show that these conditions were better met by the Westinghouse airbrake than they were by the Vacuum brake.)

Weight of brake shows a considerable advantage to the Westinghouse, the Vacuum brake exceeding it in weight by 152 pounds, or 17 per cent. This difference would be further increased were a smaller sized Westinghouse apparatus used on the wagons, which would be amply sufficient.

The time taken to supply a number of empty trucks with full brake pressure is greater on the Westinghouse than on the Vacuum, the Westinghouse being charged to 50 pounds in 5 minutes, and the Vacuum to 18 inches in 2 minutes 26 seconds. These pressures may be regarded as minimum working pressures at which the brake is efficient.

The time taken to release the brakes by hand is also considerably in favor of the Vacuum; but while it is nearly invariably required to be done with the Vacuum brake when vehicles are detached from the engine, it is not required to be done with the Westinghouse, except when the brakes have been applied after the engine has been detached, a thing which cannot be done with the Vacuum brake.

The brakes on one vehicle in the middle of the train being disabled, the vehicle to be made ready for transit without disturbing the train or shunting it off. This can be done in a few seconds by the Westinghouse brake by simply turning a tap. In the Vacuum brake it can be done if any part of the brake levers is disabled; but even then the guard requires a "pin punch" and a hammer, and as the guard is not usually in possession of these implements in actual practice, delay would inevitably result. Should a "breakdown" be in the patent parts of the brake, a rolling ring stick or release valve clog by grit, the test did not show if it was possible to throw the brake out of working without shunting the disabled vehicle.

While cocks require care and intelligence in working, they are of very great practical convenience in such cases, and though it is perfectly possible to work the Westinghouse brake without any cocks, the inconvenience of so doing would be as apparent as in the Vacuum brake.

The Westinghouse brake sucking in air at only one point (the pump) is little affected by dust and grit, and the mere fact of its working in some of the hottest and dustiest countries in the world without the slightest inconvenience, shows that dust and grit have practically no effect on it, while they affect the Vacuum, even in the moist climate of England. The triple and quick-acting valves under the wagons are, moreover, strongly made, and are actuated by such strong forces that any dust or grit is pushed on one side and cannot impede their action. With the Vacuum brake, air is constantly sucked in at all leaks and at every coupling, and on an emergency stop rushes in at every wagon. Though the present valve may be improved, it yet remains to be proved whether the modification will not so diminish the rapidity of the brake that shocks become of constant occurrence, instead of occurring only occasionally, as at present. The small ball valves, though apparently simple, are pressed to their seats by such a small amount of force that dust cannot be crushed, and small particles of foreign matter may easily prevent the action and destroy the power of the brake.

The trials down the long incline showed that the Westinghouse brake at the foot had considerably more power than at the summit, and as the auxiliary reservoirs can be recharged in a few seconds, after the brake has been released, I cannot see how any driver of ordinary intelligence could exhaust the Westinghouse brake, a feat which appears difficult, if not impossible, in the hands of a skillful man who is endeavoring to do it. With the Vacuum brake the case is far otherwise. On descending the Katoomba incline, the brake, though skillfully handled, was found at the foot to have not been acting for some considerable time—or, in other words, exhausted and inefficient—on 10 of the rear 20 wagons and on two out of the front 15 wagons. No explanation was offered by the representatives of the Vacuum brake, except that oil had fallen on some of the cylinders when in the shops, and that consequently the rubber rings had slipped up and allowed the vacuum to be destroyed. I find, however, that all oil in these cylinders was removed by "benzine," that nearly all the rubber rings were renewed, and out of these particular 10 cylinders which were found not to have acted in running down the incline, all but one had, when tested in the shops, given an excellent result, and proved completely tight. One gave only a fair result. I am, therefore, driven to the conclusion that the oil in the cylinders had no effect whatever on the exhaustion, and that either the power leaked away in the one and a half hours' run from Katoomba, or that the graduating power of the Vacuum brake is so defective in the rear part of the train that the movement of air to apply the brake was so slow in the rear of the train that it could not move the ball valves, and consequently that the air, which was intended to reach one side of the piston only, passed the ball valve, and reached the other side of the piston also, thus putting it in equilibrium, and thereby taking off the brake, and leaving it in the condition in which it was found at Glenbrook. When one-third of the brakes of a train are found to be inoperative after descending 3,000 ft. on long grades of 1 in 33, something is radically the matter, and it is very significant that the Vacuum company's agent asked for no further trial, and did not ask that the cylinders should be examined that afternoon on reaching Penrith, in order to show that this performance ot the brake was something abnormal. The conclusion is obvious that this exhaustion *is* normal.

The fact that the Westinghouse quick-acting brake is essentially suited for good strains and for long gradients and sharp curves is shown by the fact that it is the only automatic brake used on goods trains (with insignificent exceptions) in the world; and, secondly, that on the railways in the most mountainous part of the United States, with longer and steeper inclines than ours, aggregating 28,127 miles in length, 66,700 freight cars out of 98,831 were equipped with the Westinghouse brake upward of a year ago, and that it is now being applied to over 50,000 wagons per annum.

The quick-acting Vacuum, while in working order two and a half years ago, is not yet in practical working on any railway.

While the Westinghouse brake requires periodical oiling and examination, it is not so liable to fail on the vehicles as the Vacuum. This is clearly shown by the Board of Trade returns, where the failures on vehicles, apart from hose pipes, are seven times as numerous as with the Westinghouse. Frequent failure of a Westinghouse hose pipe appears peculiar to England, and is probably caused by the climate, as it does not appear elsewhere. The main parts of the Westinghouse brake—the piston, cylinder, triple valve and reservoir—give little trouble and require little repair, and the cost of their maintenance is undoubtedly low. Statistics show that the pump of the engine is but little more liable to fail than the ejector on the Vacuum. Experiments here show that the friction of the Vacuum rolling ring is 10 per cent. of the total pressure on the piston, thus conclusively proving that it does not roll under pressure, and so accounts for its wear and frequent displacement. While the current of air from the Westinghouse pump conveys oil to all parts of the apparatus automatically, the Vacuum brake cannot be oiled, and, therefore, its inventors are obliged to use a piston packing which is hardly known in other machinery, but is the only packing that can stand the absence of lubrication. I am, therefore, of opinion that while the cost of maintenance is low with both brakes, it is in favor of that which is at once lubricated and protected from dust, while experience in England and elsewhere show that, with long trains, the consumption of fuel would also be greatly in favor of the Westinghouse brake.

While the simplicity of the Vacuum brake is obvious, and the complexity of the Westinghouse brake appears objectionable, simplicity may be dearly bought at the expense of certainty of action. The quicker application and release of the Westinghouse brake, its greater convenience in shunting and detaching disabled vehicles, with its far greater command of power, its diminished weight, and its greater range of motion to take up the wear of brake blocks and tires, far outweigh any supposed advantages due to simplicity.

Economy in Train Service.

At the last annual meeting of the Railway Superintendents' Association, Mr. W. G. Wattson, of the West Shore Railroad, read a paper on Economy in Train Service. Concerning train service, he said, the basic principle is safety to life, limb and property. The commereial principle is rapid transit. Some may suggest that the commercial principle is low rates, but a little investigation will show that low rates are generally put in to make up for difference in train service. In the railroad business the train service is the thing of real value. The test of economy is the character of the service rendered. The principal factors are safety and rapid transit.

Good track with ample sidings and terminal facilities is the necessary foundation of all successful and economical management. The character of the locomotives and rolling stock exerts a large influence. Sufficient telegraph lines to readily accommodate the business and the keeping of them up to standard is a most important consideration. The use of air brakes makes it possible to increase the speed of freight trains and at the same time reduce the risk of accidents.

* * * * * * *

To run trains on time is the first consideration. Schedules should not be faster than can be made regularly. Nothing hurts a road so much as to be frequently behind time. Extras should be run as sections of regular trains, or on special time tables, the latter course being preferable to running a section much behind time. Most frequently it is the train behind time or the extra that gets into trouble. Great care should be exercised in the selection of conductors and train men. Qualities to meet and deal with the public in a pleasing manner are essential, and when such qualities are lacking, priority of service should be ignored. Cars should be thoroughly cleaned inside and outside before starting on runs, well lighted, and trainmen educated to watch the ventilation closely and intelligently; thermometers being desirable in every car.

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Engines and train crews should run in groups; special fast freight crews and engines; through freight crews and engines; pick-up or distributing crews and engines; local freight crews and engines. The engines and train crews assigned to the respective groups to be selected with special reference to the work, and run "first in, first out." This will keep the engine and train crews on the same runs, and, in the majority of cases, the same engineers. In busy seasons sufficient extra crews should be kept in service to prevent overworking the men. It is, of course, highly desirable that every crew should be able to satisfactorily cover every run, but experience demonstrates beyond doubt that the safest and best work is done when engineer and train crews are kept together on the same runs. This is especially so with fast freight and distributing trains. I am convinced that the maximum engine performance and minimum fuel consumption may be obtained by running engines strictly "first in, first out," known as "chain ganging," but I do not believe that the gain is sufficient to justify sacrificing the principle of keeping crews together in the interest of safe and prompt service.

The systematic making up of trains with reference to the destination of cars is worthy of careful attention. No excuse should be accepted for starting a train out on the road not properly made up. The place to do switching is in the yards, not on the road. In the majority of cases the trouble in blockaded yards is with the switching of cars received in trains, and the yard work is generally simplified when arriving trains have cars in proper position. Every empty as well as loaded car should be accompanied by a running slip showing destination, and all cars for a common destination should be kept together. Cars picked up along the road should be in proper position in trains by conductors. This work can be readily supervised by an occasional examination of reports on file in the car record office.

No engine should be given more cars than it can readily handle over the entire run, the condition of the weather always taken into consideration. The chances of accident to a train running 30 miles per hour and keeping ahead of passenger trains, are much less than that of the overloaded train taking siding or crossing over for every passenger train on the road, and besides the commercial value of the service is much greater. Each caboose car should be supplied with a set of good wrecking frogs. Their cost will be more than compensated for in the saving of delay to the road's traffic and the expense of ordering out the tool car.

The working of freight train crews up to the maximum limit of human endurance, sometimes beyond, is not without calamitous results. This is a serious question on many roads especially when the crews are paid by the trip. During the busy season, perhaps for six months of the year, everything is at high tension, and for seven days and nights of every week trains are ready to go out as fast as crews come in. Here comes in the query, Shall we build up new crews, recruiting from the ranks of "floaters" and by the employment of green men, or shall we press the old crews continuously into service? On either hand there is danger. If new crews are built up, finally comes the dull season, and the new men must be let out, for, if retained in the service, there is not sufficient time to be made by either the new or old men to pay their expenses, and all become dissatisfied, which spirit breeds carelessness. How to absorb into general service through the dull season sufficient reliable freight crews to meet the requirements during the busy season is the question, and on the ground that most efficient service is the most economical, it ranks first in importance among the many difficult problems which the superintendent encounters in his efforts to perfect a good train service.

One of the most prolific causes of accidents is the frequent changing of men, many of whom being left without restraining influences, fall in with the great contingent known as "floaters,"—the bane of the railroad service. The man that is brought up on the road, carefully educated in its methods, and developed under a strict discipline, is the ideal trainman; and if by chance or by lapse of some human attribute, he fails at a critical moment, nine times out of 10 he can be saved with profit.

* * * * * * *

For a safe and prompt movement of traffic over a crowded track, say 25 or more trains each way per day, the use of block signals is absolutely necessary, and with the effort to handle an increasing traffic at higher rates of speed, this fact is becoming more evident every day.

The block system in use on the New York Central between New York and Albany was then described after which the paper continued:

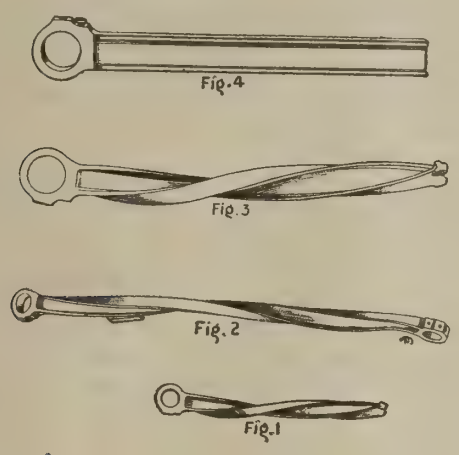
During the month of August last, 3,160 trains were run, an average of about 100 trains per day, the shortest regular run being 33 miles. During the month 92 clearance orders were issued to passenger trains, and 75 to freight trains, an average of about five per day. There has been one rear end collision during the past two years, which was due to a defective signal not going to danger, permitting a freight train to follow another in the same block without notice. The first train broke in two, and the detached portion was struck by the following train, doing slight damage to a caboose. The failure of the block signal in this instance, did not contribute to the accident.

We believe this system embodies everything practically essential to prevent rear collisions between trains. Under the absolute block system, in order to move trains over the line promptly, the block stations must be very close together, say not more than four miles apart; and consequently a much larger expenditure is required for plant and operators than under the permissive system, and, so far as our experience goes, without any better results. The permissive system has a great advantage over the absolute system in the matter of train flagging. Under it the conductor and flagman know that trains *can* and *do* follow other trains into the same block, and are on the alert to prevent collision. The superintendent knows the same thing, and, if possible, is more vigilant to see that the flagging rules are uniformly observed than if there were no blocks, as there can be no doubt that block signals of any kind create a tendency to trust them for protection. But under the absolute system this tendency is much greater than where permissive blocking is common. The conductor and flagman run a year without seeing a headlight behind them and finally believe that trains *cannot* follow other trains into blocks. Everything runs along smoothly for months and everybody begins to believe the blocks are absolute, and train flagging lapses. About this time some operator makes an error or an engineer mistakes a block signal; then there is trouble.

Breakage of Locomotive Side Rods.

At the last meeting of the Southern Railway Club papers were read on the above subject. A communication from the superintendent of motive power of a Western road favored the use of channel section rods made of open-hearth steel of a quality that should show a tensile strength of about 75,000 pounds and an elongation of 23 per cent. in the test section. The only channel side rod of this material that ever broke is illustrated in the annexed engravings. The immediate cause, says the communication, was the breaking of the rear driving wheel axle close to the hub of the right wheel, allowing the wheel to fly off and down the bank. This had no sooner occurred than the left hand back wheel also broke and went down the opposite side of the bank. Figs. 1 and 3 represent different views of the same rod. You will observe that it twisted to almost two spirals before it broke. The rod shown in Fig. 2 did not break; it merely got one complete twist. This shows remarkably fine material.

A short time after this we had a rod, similar in design and on the same class of engine, break while the engine was running about 30 miles per hour. It did not twist but broke off short. There was no apparent reason for it unless the engine caught on sand on one side. We made laboratory tests of this material, expecting to find a marked difference



in it. Rather to our surprise all showed well and everything was within our specifications.

Mr. James Meehan, Queen & Crescent, devoted great attention to side rods, and whenever a rod broke he had the material tested, and he frequently found that the material near the point of fracture indicated a change of structure due to fatigue of the metal. The metal would be coarsely crystalline and easily broken. He had been in the habit of making rods of selected scrap, and never had one of them break, but some of them that cracked were detected in time. He was now using basic steel. He believed in the solid end side rod. He had used bushings in back end of main rod, and an engine with that form had made 127,000 miles without needing rebushing. This was made of brass, 5½ of copper to one of tin, cast with a lead flux. He did not believe in high grade steel for side rods, and thought that 75,000 pounds tensile strength was too high.

Mr. W. H. Thomas, of the East Tennessee, Virginia & Georgia, stated that he had no trouble with heavy rods breaking, but that the light rods which were put in service years ago occasionally broke. They were all made of iron and had straps and keys.

Mr. J. J. Casey had had about a half dozen rods broken in the last few years, and had noticed that each of them had run about 450,000 miles. They were all rods of rectangular section, fitted with straps and keys. He believed these rods were liable to failure after having made a certain mileage. His standard is now a solid end rod, with oil cup forged on. He has used fluted rods for some time, and has had none of them break.

Secretary Marshall called attention to the fact that cracking in rod ends often starts at the sharp corners of the keyways, and at the oil hole. Such cracks generally start on the interior of the head, next the brass. To guard against them oil cups are being forged on, and straps are thickened at the keyways.

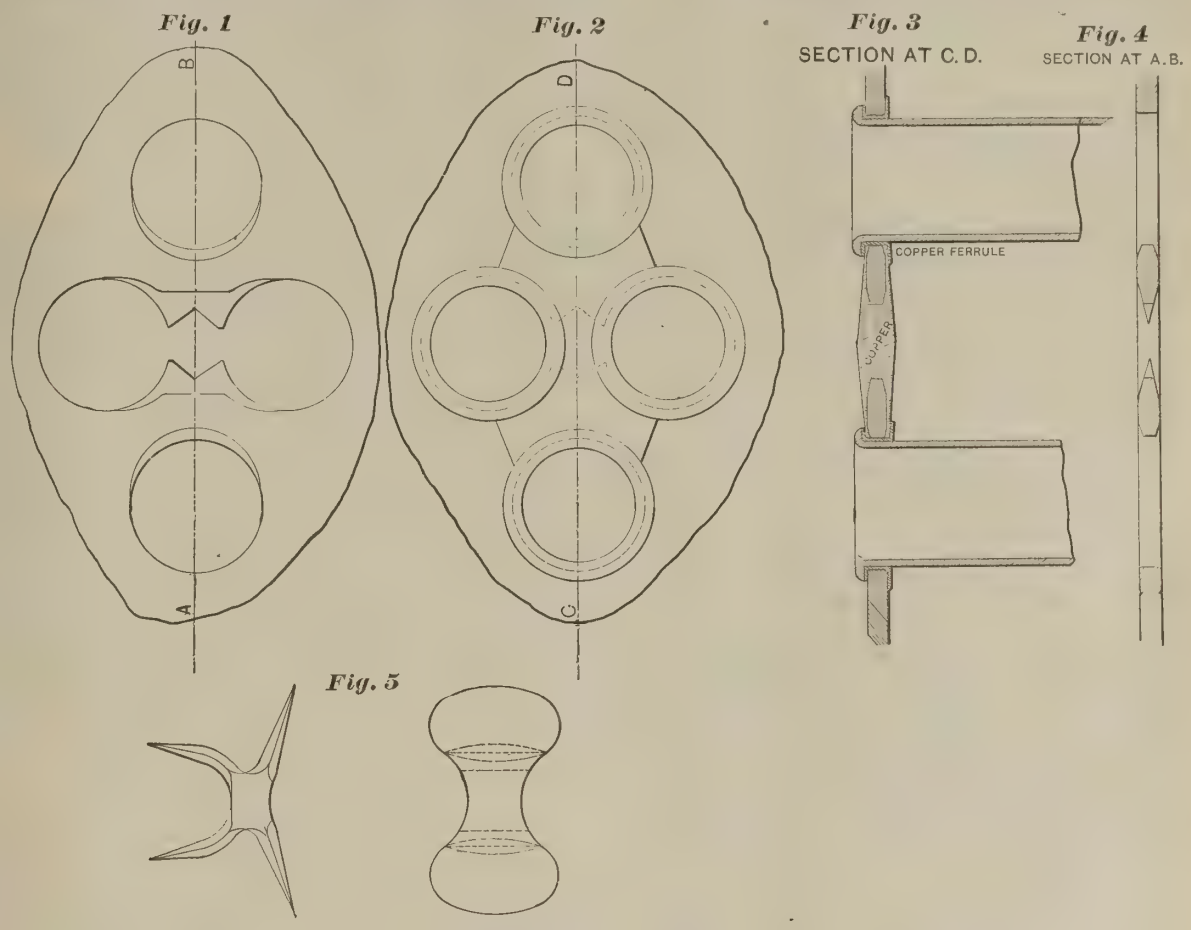
A Female Locomotive Engineer.

Ida Hewitt is a young woman who runs a locomotive on the Cairo short line in West Virginia, which is a narrow gauge connection of the Baltimore and Ohio. She is 24 years old and is said to be very prepossessing in appearance. Miss Hewitt is the daughter of one of the chief owners of the Cairo short line. The machine shop of the road stands near Mr. Hewitt's house, and Ida when a child played around the shop and learned about the mechanism of locomotives. It became a passion with her to ride on them. She even learned the use of the tools that are used on a locomotive. A few months ago the single engineer of the road fell ill, and Ida volunteered to do his work at the lever. The man died and Miss Hewitt, having run the engine up and down the line to everybody's satisfaction, was made the regular engineer. She is a blonde, and wears a cap over her hair, a suit of blue cotton goods, heavy shoes, and gloves. Her locomotive is much neater than when a man was the engineer, and she has been behind time only once. Mrs. W. Newton Lynch, West Virginia's representative on the Board of Lady Managers at the World's Fair, discovered this fair phenomenon. Miss Hewitt will be invited to take a train loaded with West Virginia's mine and forest products to Chicago.

To Replace Broken Bridges in Flue Sheet.

In connection with the annexed illustrations Mr. William Smith, superintendent of motive power of the Chicago & Northwestern, writes us:

Herewith I hand you blue print showing how we replace broken bridges in back flue sheet. Fig. 1 shows how the sheet is scarfed and dove-tailed. Fig. 2 shows it finished. When an engine comes in for repairs, and has flues changed, instead of plugging and riveting, we take a piece of copper, as shown in Fig. 5. We bend it over the lugs, as shown, so it will pass through the flue hole; we



BROKEN FLUE SHEETS.

then put it into place. This piece being made of soft copper, it is then hammered into the dove-tail, and also hammered into the top and bottom flue, as shown in Fig. 1. All the surplus copper is then dressed off. We put in the copper thimbles then, and lay them over the sheet and the copper patch, with the mandril stock in the ferule, while we are laying them over both inside and out.

We then put in the flues and work them the same as we would any other flues; either expand them or roll them, as you desire. We have a good many of these running in our engines, and have had them in nearly two years, and there are no signs of weakness or leaking in them so far, and it makes it just about as solid a job, when properly put in, as the sheet itself. You will observe it is held by four flues, and it is almost impossible to leak; in fact, none of them have ever leaked for us. This is the best method of fixing them that I have ever seen. Perhaps some one else has a better way, but as yet I have not seen it.

The Old "Samson."

The department of transportation of the World's Fair is offered a valuable relic of the early days of railroading in this country and will doubtless secure it for an exhibit. The old locomotive "Samson," built in England in "the thirties" by the celebrated Timothy Hackworth and brought to this country in 1838, is still in existence and in working order. Accompanying it is a quaint old passenger car built in imitation of a stage coach, both standing on some of the old scolloped or fish belly rails. The engineer who first ran the locomotive is still alive, and if still living at the time of the World's Fair may accompany the venerable engine. Those who were at the Exhibition of Railway Appliances in Chicago in 1883, will remember the whole outfit connected with the "Samson." The offer to sell the old machine does not strike us as a very high spirited move on the part of the company which is the owner of it.

The Common Brake Failure.

The press dispatch that attributes a railroad collision to the failure of the air brakes to work when applied is not so common as it once was; yet is to be found occasionally in the morning papers. One of the last instances of this kind was concerning a disastrous collision on the Union Pacific at Port Neuf, Ore., when five men were killed. The engineer of No. 2 which caused the collision insisted that the brakes would not work when he attempted to apply them, but the evidence of the conductor conclusively proved that the engineer had blundered in some way, and failed to turn the valve handle.

The conductor testified that as it was a short distance to the meeting point he would not work his train until he had met and passed No. 1. He was riding in the baggage car, and heard the engineer whistle for Port Neuf. After waiting a few seconds and not feeling the brakes go on, he stepped to the side door and looked out, but could not locate just where he was. He then stepped to the other door, and found they were about fifteen car lengths from the other train. He pulled the conductor's valve, and kept it open until train stopped. No. 1 had pulled up within four car lengths of north switch. No. 2 had to come around a very short curve. The fireman and brakeman say that they did not see nor hear the engineer attempt to apply brakes at all. The engineer claimed he could not get the brakes on, but after the conductor pulled the valve the air came forward. Of course this is all nonsense, but he had to make some excuse. When the conductor pulled the valve they were all getting off the engine. There is no doubt that the engineer overlooked his hand, and forgot his orders, more especially as the regular meeting point was at the next station. The fireman called to the engineer that they were getting too close, but he did not offer to apply brakes. I think the engineer thought it was a freight train, and that they were on side track. The engineer was on outside of curve.

A Ninety-two Miles Fast Run.

Ninety-two miles in ninety-two minutes, with four stops, is fast traveling, and, all things considered, is worthy of special comment, even among the feats recently accomplished in the "rapid transit" line. This run was made by a Royal Blue Line train on the Baltimore & Ohio Railroad, Sunday, Oct. 4, without special arrangements in advance for a trial of speed. The train consisted of a combination car, two passenger coaches and the Pullman parlor car Dahlia. It was in charge of conductor L. H. Bender, and drawn by locomotive 853, built at the Baldwin works, with Engineer J. W. Hanson at the throttle.

The train left Camden Station on schedule time, 8:50 A. M., reaching Locust Point a few minutes later. There its progress was blocked by a fire at Elevator A, directly alongside of the ferry slip. The heat was so great that General Agent Beeler was afraid to let the transfer boat enter the slip, being confident that if he did so the boat would catch fire and a panic among the passengers, of whom there were a large number, and perhaps possible loss of life, would ensue.

Finally the transfer boat was taken to the wharf of elevator C, the passengers put aboard and carried to Canton.

The run from Canton to Newark, Del., 54.4 miles, was made in a little less than 56 minutes, including a stop of about two minutes at Bayview Junction. From the latter point to Newark no stops were made. From Newark to Philadelphia, 37.2 miles, the time consumed was 36 minutes, including stops at Wilmington and Chester. A part of the time the train was run at a speed of 72 miles an hour.

The St. Charles Car Company has recently closed contracts for about 600 freight cars. The orders include 50 provision box cars for the Armour Packing Company, 300 coal cars of 60,000 pounds capacity for the Texas & Pacific, 100 box cars for the Cairo Short Line, and 100 cars, including box, platform and coal cars, for the Paducah, Tennessee & Alabama road.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

FAST PASSENGER TRAINS.

The distance between important cities on this continent is so great that much time has to be consumed by business men in making journeys that are of frequent occurrence. To sit inertly in a railway train is not in accordance with the tastes of Americans, and it is not surprising that there should be a constant demand for faster trains, and complaints that existing speeds are not consistent with the requirements of business. Complaints of this kind are well founded, for there is no really high-speed train for long distances on this continent. The most important routes of travel are those between New York and Chicago, yet the most urgent of the passengers making this journey have to content themselves with an average speed between termini of less than 40 miles an hour for a distance of 980 miles. There has been for some time a run on the Baltimore & Ohio between Washington and New York which has the right to be called fast, the distance of 230 miles being passed at an average speed, including stops, of 51¼ miles an hour. This is now eclipsed by a train on the New York Central, which has commenced to run from New York to Buffalo, a distance of 440 miles, in 8 hours and 40 minutes, a speed between termini of 52 miles an hour, making it the fastest train in the world. This includes four stoppages and numerous reductions of speed for curves, towns and taking water, so that the actual running time has to be kept at about 60 miles an hour for the entire distance.

The new train on the New York Central is doubtless a precursor of what will be done in the way of transporting passengers in quick time over the space between the seaboard and Chicago during the Columbian Exposition. There is no doubt that this train will lead the way to higher passenger train speeds throughout the country. While watching the feat of running the special that passed over the New York Central from New York to Buffalo at a speed that only lacked three minutes of being 60 miles an hour for the entire trip, and that of running the new regular train on the day it first started out, we were forced to the conclusion that the motive power was the only element in the problem of fast travel that was entirely satisfactory for the work to be done. We have heard a great deal said and written by amateur engineers about the strange species of locomotive that must be designed to keep up a speed of 60 miles an hour with a paying load. They insisted that the engine was the weak link in the mechanism of high speed trains. We have enjoyed the best of opportunities for watching the performance of eight-wheel American-type of locomotives hauling a paying train for a long distance at 60 miles an hour, and the impression received was that the engine is abundantly able to perform its part. In the lightest train the engine had to move 230 tons at an average velocity of 88 feet per second. This represents enormous work and puts a tremendous drain upon the steam-making capacity of the engine, but with fair coal this was found to be entirely satisfactory. It was shown, however, that the piston speed of a locomotive must not greatly exceed 1,000 feet per minute to pull a train freely. When that speed is exceeded the engine sets up internal resistances that appear to absorb a high percentage of the work done.

While the locomotive is equal to the service required, there are other elements in the problem of running trains at high speed which are very imperfect. A track and roadbed adapted for 45 miles per hour speed is not satisfactory when the speed is increased 20 miles an hour. The curves require more elevation and greater attention must be bestowed upon joints. The bridges must be stronger and the switches and frogs put in perfect alignment. But the most defective element is the provision for preventing collisions. A perfected signaling system is essential for the safe movement of trains at a speed of 60 miles an hour. These are the lines of improvement that must be followed to make American railways equal to the task of running express trains safely at an average speed of 50 miles an hour over prolonged journeys.

Some of the latest feats of fast running in this country are noteworthy, on aocount of the great weight of train hauled. Three years ago, when the railway companies in England were racing between London and Edinburgh, there was very good speed made, but the trains were light. The London & Northwestern ran from London to Glasgow, 401 miles, at a running speed of 48½ miles an hour, but the cars never reached the weight of 100 tons. The train for Edinburgh by this line weighed 85 tons, exclusive of the the locomotive, and was run at 51 miles an hour. The heaviest of the racing trains was hauled over the Great Northern, and its weight, exclusive of engine, was 225,120 pounds. The speed made was 48 miles an hour. These figures will show to our readers that American railroad managers not only now undertake to run great distances at a higher speed than that maintained on the most famous trains in England, but that they have locomotives which will pull much heavier trains at the velocity required. This condition of affairs is a remarkable testimonial to the builders and designers of American locomotives.

STATION SIGNALS.

There have been several meetings of railroad officers lately that were noteworthy for the attention devoted to the subject of station signals. It is only a few years ago since leading railroad officers were willing to put themselves publicly on record as believing that station signals would never be necessary on American railroads and that their use would be calculated to demoralize the trainmen on whose care, intelligence and vigilance the safe movement of trains must always depend. Railroad companies can no more afford to-day to dispense with the qualifications mentioned in their trainmen than they could in the times when the safety of trains depended principally on the engineers keeping a sharp look out for the smoke of other trains; but all the railroad managers worthy of holding that position are beginning to recognize that their enginemen and conductors must be provided with increased facilities for doing their work safely and keeping trains apart. Individual vigilance and powerful brakes have hitherto been the means depended upon to prevent collisions; now railroad men are compelled reluctantly to admit that signals must be adopted. On the more crowded systems of our railroads the necessity for a system of signals has been forced upon managers years ago, but the good results that may be obtained from a proper signal plant are lost through the tendency of Americans to design mechanism to suit their requirements.

Let us imagine a case for illustration. I. B. Smart and others form a company to build a railroad in a region where no other railroads penetrate. The grading is done, and when it is time to begin laying track the question of motive power comes up. Some one suggests that there are engines operating other railroads in distant parts, and that the course of wisdom would be to buy some of the same kind of machines. "Not at all," says I. B. Smart, "I am no mechanic as you all know, and I have never seen any of their foreign locomotives and don't want to. I shall design a locomotive for our line, and we can build it in our blacksmith shop cheaper than we can buy one, and have a better engine, too." Most of our readers would exclaim that Mr. Smart was a conceited ass and an expensive luxury for a railroad company to have as a manager. Yet his methods are closely analogous to those followed in regard to signals by a great many managers who are considered particularly smart railroad men. The development of a first-class signal system has called for nearly as much united ingenuity and thoughtful inventing and improving as the development of the locomotive, yet when many railroad men have the need for signals forced upon them they are ready to start at the beginning, ignore everything that has been done in signal development, and have primitive appliances made in their own blacksmith or carpenter shops when they could purchase proper appliances at smaller cost. The common chapter of experience is to put defective home-made signals into use, find out that they are of little service, abandon them and forever protest that station signals are no good, for they have been tried on the road and found worthless.

Another class of railroad men with need for signals are always falling into the hands of inventors who have patented an impracticable trappy concern that is going to indicate danger when no trains approach each other. The invention is tried and found wanting and is quoted as another proof that signals are a humbug. Money is wasted in making worthless home made signals and in purchasing cheap impractical devices that are dear at any price. When it is suggested that the course of prudence would be to negotiate for the introduction of signals with a company whose appliances are recognized as successful, the protest is raised that the company cannot afford the expense although it has had to stand nearly as much on impractical or useless devices. This tendency is peculiarly rampant among certain railroad managers. They are always in terror lest they should contribute to the prosperity of the company having first class articles to sell. They feel that they are distinguishing themselves by saving five per cent. in purchasing an air brake of uncertain utility when a thoroughly reliable one is to be had; they will mix the pattern of their locomotives and cars to save two per cent. on first cost, which is more than swallowed in extra cost of repairs within a year. The penny wise and pound foolish policy of managers who are wasting money for many railroad companies is spreading diversity of forms where uniformity is of the utmost importance. This tendency is the most formidable obstacle to the introduction of good signaling systems. A ball here, a swinging arm there, a semaphore in one place, and a disk in another, is not the way to equip a railroad with signals. That very common practice merely breeds confusion and leads to neglect of the supposed language of the signals. There is a great deal of talk to be heard at present about the necessity for giving instruction on their duties to the lower ranks of railroad men. We do not know of anything that is more urgently needed than instruction to the higher ranks of railroad men about signals and signaling.

INTERVALS BETWEEN CLUB MEETINGS.

At the last meeting of the New England Railroad Club a movement was made to reduce the number of club meetings during the year, and similar action was taken by the Southwestern Railway Club. It sometimes requires a good deal of courage to look the inevitable in the face and acknowledge its power, and those who have moved to reduce the number of meetings voice a widely felt sentiment that the seasons for public speech and action about railroad questions recur more frequently than questions worthy of being discussed come to the front. Threshing old straw is not considered a profitable or entertaining operation. It is a melancholy fact that some of the topics recently discussed by the railroad clubs have been exceedingly musty. It is the course of wisdom to acknowledge this and regulate the meetings to suit the business to be considered. When subjects are brought up for discussion merely because something must be provided to talk about, there is not likely to be anything of a very edifying nature said or done. Discussing wornout topics is not an actual harmful practice, but when other railroad men find that those who attend the clubs are devoting their time and attention to talking on subjects worn out by excessive use, the tendency is to conclude that the men so engaged would be better at home.

There is no more vigorous railroad club than the Central, which meets in Buffalo every three months. There is always some living question to be taken up, and the long interval between the meetings enables the members to attend without having to be too often away from home. If most of the other clubs would arrange to meet every second or third month, we are persuaded that there would be a better attendance and more valuable discussions.

A CATECHISM FOR TRAINMEN.

At the annual meeting of the Society of Railway Superintendents held in New York last month, a committee was appointed to devote its time during the coming year to the preparation of a catechism for the examination of trainmen. This is a particularly good move, and the only fault we have to find with it is that the time to be devoted to the subject was not spent last year instead of in the year to come. Railroad officers have been exceedingly slow to give practical recognition to the fact that trainmen require training in order to fit them for the important services required of them. The time was when a young man could leave the farm or the workshop and enter at once acceptably upon the duties of fireman or brakeman—the introductory step into train service. As soon as the one learned to keep up steam by shoveling coal into the firebox when the smoke began to get clear; and when the other found out at what times and places to twist on brakes they were both considered efficient trainmen and the idea of questioning them respecting the extent of their knowledge about other matters relating to engine or train operating was never entertained.

On many railroads these primitive practices still are followed, and no more thought is bestowed upon catechising trainmen concerning their knowledge of the business they are engaged in than there is of inquiring into the state of their souls. Even the railroad world is moving, however, and the most conservative of railroad managers are beginning to realize that something must be done to distinguish between ignorance and intelligence in train men hence the movement in favor of catechisms and manuals of instruction. The constant progress that is

going on in the introducing of complex mechanism which must be well understood to insure the safe and prompt movement of trains renders the better instruction of train men imperative. Where trainmen are now noted for ignorance, there we find accidents, inconvenience and delays of trains, keeping the men in charge in a constant state of worry and excitement.

THE OPEN SWITCH.

One of the most common forms of fatal railroad accidents is the running into an open switch. This form of disaster kills a great many people annually, but they are mostly in twos and threes at a time, and the victims are generally employés of railroad companies, so there is little sentiment regarding the carnage that is terrible when considered in the aggregate. An open switch accident that happened on the Chicago & Eastern Illinois last month has attracted unusual attention because three newspaper men were killed in the wreck. Three enterprising newspaper reporters obtained permission to ride on the locomotive of a night express train for the purpose of writing up their impressions of the exciting run. The glare of the fire as the fireman keeps repeatedly throwing the door open while an express train is dashing through the darkness, the noise and roar of the train as it darts through somber woods and deep cuttings, the shrieks of the whistle on approaching stations and crossings, the sheen of headlights in sidings and the rattle and swing of the engine, make the first ride on the locomotive of an express train at night a most impressive event. The experience tries the courage of the timid man, but the reporters who went out on the Eastern Illinois express were no doubt able to go through the novel experience without fear. We can imagine each gathering in his mental reservoir all the varied events of the journey. As the running speed was maintained to pass a siding near Crete the switch was found to be open. Then comes an instant of apprehension, a violent jerk from the emergency application of the air brakes and the engine crashes through an old round house, turns over and four men are crushed to death in the wreck.

The only excuse for this kind of accident is, that it is the general practice to use targets on switches that are not made to be seen at sufficient distance to enable an engineer to stop a train. In no department of railroad operating is improvement more urgently needed and in no case involving so much to life and limb, could an effectual remedy be so easily carried out. It would be no hardship to compel all railroad companies to protect switches with signals when they cannot be seen readily from an approaching train.

THE TRAVELING HOG.

The following pithy comments are made by the *Engineer* as seconding our sentiments expressed in last month's issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER about the woman who takes posession of the dressing room in a sleeping car to the exclusion of others: "This disposes of the 'lady' passenger, but it still leaves the male hog in possession; something ought to be done with him. The man who gets up early in the morning and uses the only glass for bad whiskey, and then squares himself in front of the lavatory for half an hour, ought to be attended to also; he must be the husband of the 'lady' above mentioned."

We admit that the male hog was an omission that calls for amendment. We have met him in various guises and performing a variety of tricks, but a hog we encountered in a recent journey deserves special mention. The car had every berth occupied and the train was approaching the terminus, which was reached about 6 A. M., and all the passengers seemed to be ready for the wash basin about the same time. The aisle and the smoking room were filled with men waiting their turn when the hog got poseession of one of the wash basins and coolly unfolded a showy paraphernalia and with the utmost deliberation proceeded to scrape his jaws. There he stood lathering, rubbing and scraping for fifteen minutes while the waiting crowd uttered curses loud and deep but without making any more impression upon the hog than they would have made upon his brother in a farmer's pen. We entirely agree with Brother Watson that something ought to be done with the male hog, but what?

THE LAST OF THE BROAD GAUGE.

In the early days of railroading in Europe a famous controversy arose among engineers and railroad magnates respecting the gauge of track most adapted to the safe and economical transportation of passengers and freight. George Stephenson believed in the narrow gauge of 4 feet 8½ inches which he had adopted by accident, and which was the gauge used for the Liverpool & Manchester Railway. Mr. Brunel advocated a gauge of at least 7 feet, and the important Great Western Railway, of which he was chief engineer, was built according to his ideas. These two lines were held up as examples of what an ideal railway ought to be, and the battle of the gauges waged hot and bitter. Good arguments were advanced on both sides, but neither of the contestants gave in to the other and for years, the promoters of railways settled the gauge they wanted according to their preference for broad or narrow. When passion and prejudice subsided, it was discovered that a foot and a half less spread of rails enabled a company to build structure and rolling stock at considerably reduced cost. This was what eventually decided the conflict of gauges in favor of that used by Stephenson. The whole controversy has at present revived interest owing to the fact that the Great Western Railway of England which has always been 7 foot gauge is about to be narrowed to the standard. The work will be done next May and will involve a prodigious amount of expense and work. Upward of twenty miles of new sidings are being constructed at Swindon to accommodate the rolling stock which is to be taken off the line. All the modern carriages on the Great Western system have been so constructed that they can be easily converted to narrow gauge.

ILLEGIBLE MARKING OF CAR WHEELS.

Under the caption "Rule IV—clause 4" a well known master car builder raises the question, Is it not just as necessary to have a system of uniform marking for home car work as it is for foreign cars that are repaired under the rules of interchange of cars? We would answer most emphatically, it is. At the same time it is a difficult and delicate matter for the Master Car Builders' Association to establish rules as to what railroad companies shall do with their own cars. The tendency of late years has been, however, for those having the regulating of the rules of interchange of cars in control to demand that roads offering cars to other roads shall use all reasonable means to prevent disputes, and we do not think it would be an unwarrantable interference with private interests to require that wheels be marked as our correspondent suggests. Every road repairing foreign cars is put to more or less inconvenience by the confusion and irregularity of marking followed by some roads, and there would be no injustice done in requiring people who expect to do business with others to put their marks on in a way that they would be easily identified. The man who has his work done in an irregular blundering fashion generally thinks it is impertinence to call his practices by their proper names, but that kind of plain speaking is often the very best means of bringing about a badly needed reform.

The attorneys for railroad companies are sometimes the opposite of wise in the advice they give about fighting suits for damages. A just claim resisted by all the strategy of legal warfare frequently gives a railroad company advertising that is not of a complimentary character. A case in point was just decided against the Michigan Central by the Supreme Court of Michigan. A train in charge of the assistant roadmaster was loading rails along the track. To facilitate the work, the train was kept moving and the men seized the rails and threw them upon the cars, a common but dangerous practice. One rail fell down and severely injured one of the workmen. In meeting a suit for damages the company attempted to show that the man was guilty of contributory negligence, and the lawyers succeeded in preventing the plaintiff from giving important evidence on his own behalf. The Supreme Court ruled that the man's evidence must be admitted.

Among the highway crossing accidents that happened last month was one on the Staten Island Rapid Transit Railroad, where three persons were instantly killed and one badly injured. A train struck a wagon with the result stated. The place where the accident occurred is regarded as a dangerous crossing, and it is alleged that the unfortunate victims did not have proper warning of the approach of the train. Whey they saw the locomotive for the first time coming around the curve it was only a few yards away from them, so that it was impossible for them to escape by jumping out of the wagon. When Jones, the driver of the wagon, saw death staring him in the face he tried to urge his horse across the track, but the animal seemed to become paralyzed from fright and stood still. It is doubtful, however, that even if the horse had gone on the wagon could have escaped being struck.

In a recent interview with a newspaper reporter Mr. Henry Willard made the prediction that within a short time all trains on the Northern Pacific would be operated by electricity. Mr. Willard has before made predictions about Northern Pacific matters that never have been fulfilled. Other people better posted than Mr. Willard on electric and engineering questions think his latest predictions are no more likely to be realized than the wildest guesses he ever ventured to make public.

A correspondent writes us asking for a private answer to a series of questions about what constitutes a limited express train. We do not have any information respecting the difference between a limited express train except that the speed is only limited by the power of the locomotive to get over the road. If our correspondent would go on board of a limited express with a common pass as his certificate of transportation he would probably find another peculiarity of limited express trains.

On the Empire State Express.

The fast run on the New York Central from New York to Buffalo, described in our last issue, was preliminary to the putting on of a regular fast express which is timed to run from New York to Buffalo in 8 hours and 40 minutes. The first run of the train was made on Oct. 26. The intention is to time a train of four cars weighing about 130 tons, exclusive of the engine, but on the first day of the run the Vice-President's private car was added, which increased the load to 178 tons. This was a formidable train to start out with, expecting to rush it over the State at an average running speed of 52 miles an hour. Engineer Archie Buchanan did not seem the least nervous about his part of the work as he backed Engine 870 and coupled to the train.

In the meantime news of the new train had spread throughout New York, and so many people had business that took them West that morning that 148 passengers bought tickets and found seats in the cars. Besides these passengers the following invited guests found accommodation in Mr. Webb's car, viz.: H. Walter Webb, vice-president; George H. Daniels, general passenger agent; Theodore Voorhees, general superintendent; William Buchanan, superintendent of motive power; A. G. Leonard, private secretary to Mr. Webb; H. C. Duval, secretary to President Depew; Theodore Butterfield, general passenger agent of the Rome, Watertown & Ogdensburg; Angus Sinclair, editor of the NATIONAL CAR AND LOCOMOTIVE BUILDER; and a number of representatives of the daily press whose names we did not learn. As in the previous fast run, A. G. Leonard and Angus Sinclair kept the time of passing stations, and recorded time between mile posts with stop watches.

The train pulled out at 9:01 A. M. Great care was taken in rounding the numerous curves between New York and Yonkers, and it did not feel as if the train was running faster than an ordinary express, but the latter station was passed two minutes ahead of time, the 15¼ miles having been made in 21 minutes, or an average speed of 43 miles an hour. This was a remarkably good feat, to lift the train from a state of rest, check the speed at five or six points, and still keep up this high average. Engine 870, as our readers may remember, has driving wheels 6 feet 6 inches diameter, and sufficient cylinder power to turn them, besides having a boiler that makes steam as fast as it can be used. This portion of the run very clearly demonstrated the advantage of large driving wheels for excessively high train speed. Throughout the entire run of 143 miles between New York and Albany the engine seemed to play with the train, although the average running speed made was 52 miles per hour. To make up for the loss of time due to slowing for curves, and certain stations, and for reducing the speed while taking water out of the track troughs most of the running had to be done at 60 miles an hour. To run at a mile a minute is no difficult feat for a few miles with a light train, but to keep it up for 140 miles and raise the train occasionally from the lower velocities and the train weighing 278 tons, including engine and tender, is one of the greatest achievements that has ever been performed in railroad operating.

At Albany, engine 876, in charge of engineer T. Dormody, a veteran of the throttle, took the train. This engine has driving wheels 11 inches less diameter than the 870 and it was apparent soon after leaving that she was not going to do the work easily. To make matters worse a tank of very bad coal supplied the fuel, and the best of coal is none too good for such a run. Dormody lost time, although it was no fault of his own. All that energy, intelligence and skill could accomplish was expended on the engine, but the train reached Syracuse eight minutes late after making a stop at Utica.

At Syracuse engine 862 took the train. Engineer Charles Hogan, who was in charge, is noted for the fine runs he made on several occasions with late express trains and great running was expected of him. He started seven minutes late and the general expectation was that he would reach Buffalo in time. The driving wheels of this engine are 69 inches diameter. The engine steamed well and worked satisfactorily in every respect, but she had not got out twenty miles from Syracuse when it was apparent that there would not be much time gained. It was easy for her to raise the speed to fifty miles an hour, but beyond that it was a tedious struggle. The first hundred miles of the division is a steady upward pull and do her best the engine could seldom get the train up to a mile a minute. By the time the summit of the division was reached the train was 14 minutes late. From that point for about 50 miles to Buffalo the track descends slightly. Here fast running began, and here the interest in the run became exciting. As the time keepers called out the time taken on successive miles, railroad officers and reporters grouped around in a body listening with breathless attention for the next record. The calls made successively 58 seconds, 54 seconds, 53 three times, 52, 51½, and then there was a hearty cheer which lessened the tension and set the reporters betting on how close to the schedule time the train would arrive. Buffalo was reached at 5:43, that being three minutes late. The average running time between Syracuse and Buffalo was 55 miles an hour. All the locomotives doing this running were designed by Mr. Buchanan and built by the Schenectady Locomotive Works.

Personal.

Mr. Thomas Kearsley, Master Mechanic of the Elmira, Cortland & Northern, has resigned.

Mr. Albert P. Dane has been appointed foreman painter of the locomotive and car shops of the Boston & Maine at Boston.

Mr. W. O. Chariton, Jr., has been appointed master mechanic of the Chattanooga division of the Richmond & Danville.

Orin Ott, who recently resigned as purchasing agent of the Illinois Central, had been in the employ of that road forty years.

Mr. J. H. Simpson has been appointed car service manager of the Flint & Pere Marquette road, with headquarters at Saginaw, E. Mich.

Mr. M. P. McLaughlin has been appointed foreman of the Boston & Maine machine shops at Boston in place of Mr. C H. Wiggin promoted.

Miss Lizzie Thayer, Train Dispatcher of the New London & Northern railway, has attained the distinction of having her portrait published in the New York *Sun*.

Mr. H. C. McKelvey has resigned as Division Master Mechanic of the St Louis, Iron Mountain & Southern, to accept a similar position with another company.

Mr. Edwin Harrington, the well known machine tool builder and mechanical engineer of Philadelphia, died at Bethel, Vt. on Sept. 23, in the 67th year of his age.

Mr. A. F. Stewart has been appointed master mechanic of the Cincinnati and Huntington divisions of the Chesapeake & Ohio, with headquarters at Huntington, W. Va.

It is reported that Mr. W. L. Hoffecker, superintendent of motive power of the Central of New Jersey, has been offered a similar position on an important Eastern road.

Mr. H. B. Stone, formerly general manager of the Chicago, Burlington & Quincy, and now president of the Chicago Telephone Company, has been appointed commissioner of the World's Fair.

Mr. M. K. Barnum, who was formerly master mechanic in charge of the shops at Cheyenne, and resigned some time ago, has returned to the service of the company as general foreman at North Platte, Neb.

Mr. R. F. Kreddell, who has been for some time master mechanic of the Chicago & Erie, with headquarters at Huntington, Ind., has accepted the position of master mechanic of the Farmville & Powhatan Railroad, with headquarters at Chester, Va.

Mr. Waldo H. Marshall has been elected secretary of the Western Railway Club in place of Mr. W. D. Crossman, resigned. Mr. Marshall, who is now editor of the *Railway Master Mechanic*, has been secretary of the Southwestern Railway Club since it was formed.

Mr. J. W. Luttrell, who has been Superintendent of Motive Power of the western division of the Newport News & Mississippi Valley Railroad, has resigned after a service of several years. We understand that Mr. Luttrell has been offered a position on the Atchison, Topeka & Santa Fe.

Mr. Charles H. Wiggin has been appointed master mechanic of the Concord division of the Boston & Maine, with charge of motive power and car departments. Mr. Wiggin was formerly machine shop foreman of the Boston & Maine shops at Boston, and is a particularly able mechanic and manager of men.

Mr. D. B. Robinson, who left the Atlantic & Pacific a few months ago to become general manager of the San Antonio & Aransas Pass Railroad, has resigned. Western railroad men say that a man who can live comfortably on the San Antonio & Aransas Pass Railroad is likely to prove a tough customer when he goes home to his Satanic majesty.

Mr. E. T. Jeffery has been appointed president of the Denver & Rio Grande. As most of our readers know, Mr. Jeffery rose from the position of office boy in the mechanical department of the Illinois Central to be general manager of that road. He is president of the Grant Locomotive Works, of Chicago, and was a commissioner of the Columbian Exposition.

Mr. William Hassman has resigned from the position of master mechanic of the Cincinnati & Huntington divisions of the Chesapeake & Ohio. Mr. Hassman was formerly master mechanic of the Richmond & Allegheny before it came under control of the Chesapeake & Ohio. He was brought up on the Philadelphia & Reading, and has a varied experience in charge of railroad mechanical work.

At the election of officers of the Railway Superintendents' Association last month Mr. C. W. Bradley, West Shore, was elected first vice-president and G. W. Beach, New York, New Haven & Hartford, second vice-president. As members of the executive committee for two years Mr. R. G. Fleming, Savannah, Florida & Western, and Mr. O. M. Shepard, New York, New Haven & Hartford, were elected.

Mr. H. W. Hammond, who was appointed superintendent of the Eastern Division of the Rome, Watertown & Ogdensburg in June, has resigned. He has been connected with the Utica & Black River and Rome, Watertown & Ogdensburg road, for the last 19 years, seven as conductor and 12 years as assistant superintendent. It is understood that Mr. Hammond will be transferred to another position with the company.

Mr. W. G. Wattson, superintendent of the West Shore, is making his note among railroad men as one having unusually comprehensive knowledge of transportation problems. His paper a year ago on the distribution of freight cars excited great attention; and the paper he read last month, Economy in Train Service, at the Railway Superintendents' Convention is one of the best papers ever written on a popular railroad subject.

Mr. A. R. Cavner, a well known locomotive engineer, died suddenly in Chicago last month. Mr. Cavner was for some years a grand officer of the Brotherhood of Locomotive Engineers, and was a leader of a section of the brotherhood which opposed the general policy of Grand Chief Arthur. At one time it was thought that there was a likelihood of Mr. Cavner being made Grand Chief, but a vote indicated that his support was greatly overestimated.

Mr. John Baird, who was once recognized as one of the ablest mechanical engineers in this country, died last month in New York. Overwork broke down his mental powers several years ago. He was manager of the Metropolitan Elevated road in New York City before its consolidation. He was chief engineer of the Cromwell Steamship Line and designed many of its ships. He was for some time connected with the Delamater Iron Works in New York, and was also manager of the Burden Iron Works at Troy, N. Y.

The recent death of John H. B. Latrobe, of Baltimore, recalls the fact that he was the last survivor of the party who accompanied Peter Cooper on the trial trip of the first locomotive that ran from Ellicott's Mills to Baltimore. The rather amusing circumstance connected with this event was that the locomotive ran a race with a gray mare that drew a car on the other track, and that the latter, in consequence of a break down on the part of the "iron horse," became the victor.

There has been a dispute lately regarding the receivership of the International & Great Northern, and a rather sensational incident happened lately between two leaders of the contending interests. The affair happened in Tyler, Texas, and it was worthy of the State in its ancient belligerent days. A press dispatch describing the affair says: Col. W. S. Herndon, the railroad attorney, and Judge Felix McCord met in front of the latter's house. Hot words ensued, when Herndon picked up a brick and threw it at McCord. McCord dodged it and began to pummel Herndon with a stick, when friends interfered and stopped the fight.

Mr. Clem. Hackney has been appointed general manager of the Fox Solid Pressed Steel Company's works at Joliet, Ill. We know of no man better known among railroad men than Mr. Hackney, and his large acquaintance among this class cannot fail to make him a valuable acquisition to the Fox Company. He was a working machinist and good locomotive engineer before he became general foreman of the shops of the Atchison, Topeka & Sante Fé at Topeka. He has the reputation of being an excellent shop manager. As all our readers know, Mr. Hackney left the Sante Fé to take the position of superintendent of motive power of the Union Pacific. We voice the sentiment of many friends in wishing him the greatest success in his new position.

Col. H. S. Haines, who was again last month elected president of the American Railway Association, is of the jolly, hearty type of Southern gentlemen, a ready speaker with humorous tendencies, but withal a man who means business in his dealings with high and low on a great railroad system. Colonel Haines is so thoroughly Southern in his walk and conversation that people would not readily guess that he was born under the ocean breezes of Nantucket, Mass. He went South, however, when young, and about 1853 made his first steps in railroad service by pulling a measuring chain in the survey of the Wilmington & Manchester Railroad. The tramping line of engineering did not suit his taste, and he went and learned the machinist trade in the shops of the Northeastern Railway of South Carolina. From that he developed into a locomotive engineer, and he is still fond of telling of his experiences on the footboard in the days of hook motions, chilled driving wheels and strap rails. With his ability and training Colonel Haines advanced rapidly in railroad service, and during all the war time he was chief engineer and superintendent of the Charleston & Savannah. When the revival of railroad enterprise in the South grew he was always a leading figure, and is now the practical head of the Plant system.

Attention to Coal Economy.

The second Vice-President of the Chicago, Burlington & Quincy Railroad has issued the following circular in regard to the fuel economy of the locomotives of that system.

"MEMORANDUM RELATING TO THE USE OF COAL.

"Referring again to the matter of coal economy, would say that the results of experiments on the C. B. & Q. R. R. toward a more free admission of air, especially through the grates, have been most encouraging.

"The experiments made by using a smaller diameter stack, larger exhaust nozzles, and working engines with a full throttle and a closer cut-off, are also giving very gratifying results.

"The watching of the performance of individual engineers, by the traveling engineers and coal inspectors, has in many cases largely increased the performances of engines to fuel.

"In order that the largest possible nozzles will be used, thus doing away with back pressure and allowing slower draught, it is very important that the supply of coal at each coaling station be from the same mines, as far as possible, there being such a wide difference in character among the coals on the system, and engines using a variety of coals have to be equipped, as a rule, to burn the poorest, thus lowering their record upon the best coals they use.

"The practice of allowing engines to blow off is worthy of renewed attention. Engines may frequently be seen at stations, or elsewhere, blowing off every few minutes, without comment, while, if the fireman should get upon the tank and throw off a piece of coal as big as a hen's egg every second, there would be immediate notice taken and prompt action in regard to the same, though this is exactly what happens in the way of waste when engines are allowed to blow off.

"These facts are presented to the notice of all concerned, so they may be taken advantage of, it possible, in leading to better practice in working the motive power of the system."

Bright Prospects for the Westinghouse Electric Company.

The public subscriptions to the preferred stock of the Westinghouse Electric and Manufacturing Company will be opened to-day. The reorganization of the company has been effected under peculiar difficulties, but throughout the process the company has maintained a large and profitable business, selling its apparatus at full prices on a cash basis. As reorganized the company will be without debt and will have a cash working capital sufficient for all its purposes on an economical basis. The company claims to have made important advances in the last year in the quality and character of the apparatus manufactured by it and has developed its business in the line of street railway apparatus. Its ownership of the Tesla patents on the multiphase system of generators and motors for the transmission of power for long distances has enabled it to transmit electricity a distance of 100 miles for the running of machinery in the Frankfort Exposition in Germany. By refusing to grant licenses which would prevent it from conducting business in any territory where the licensees should become unable or unwilling to supply the demand the company enjoys perfect freedom from troublesome obligations. The consolidation of three companies into one will give the concern many advantages in the economical conduct of business.

Will Want Car Material.

In prosperous times the railroad and car building trade is a profitable one for the lumbermen. Very few railroads have been able to declare their usual dividends for the past year or two without a great curtailment of expenses, and this has generally been effected by making the old rolling stock and bridges do another year, where such a thing was possible. But the immense quantities of grain to be moved this winter has created a demand for more cars which must be supplied, and besides gives assurance of a profitable season for the railroad companies. Last year the demand for car and bridge material was very light, but will be correspondingly heavier next year, as railroad companies now feel justified in going on with improvements. This is only one of the many channels through which lumber finds a market; but it serves to illustrate the future prospects of the lumber trade in the West, and certainly indicates that recent advances which have been made in prices are only what the situation demands, and that these advances are less, rather than greater, than they should be. —*Timberman.*

The Florida Central & Peninsula Railroad Co. has commenced building large machine shops at Fernandina, Fla. Mr. M. J. Rogers, master mechanic, formerly of the Santa Fé, has charge of the construction. Four other buildings will follow the machine shops, which are to be of wood with a tin roof, 70 × 110 ft. The blacksmith shop will be 40 × 80 ft.; the carpenter and paint shop, 40 × 70 ft.; and the car shop 40 × 200 ft. The entire plant at Tallahassee will be moved to the new shops as soon as completed. There are now employed in the Tallahassee shops between 150 and 200 men.

Communications.

Safety of Chilled Car Wheels.

Editor National Car and Locomotive Builder:

While I do not believe that the NATIONAL CAR AND LOCOMOTIVE BUILDER has any grudge against the chilled wheel in point of safety, the remarks on the accident on the Housatonic Railroad, caused by the breaking of a flange, bear pretty hard on the makers of chilled wheels and hardly do justice to the subject. In proportion to the number in use, the breakages of steel wheels far exceed those of chilled wheels in any kind of service.

The Pennsylvania Railroad use chilled wheels under all their equipment, because they consider them safer than steel wheels, and Mr. Ely, general superintendent of motive power, has made the statement publicly to the Massachusetts Railroad Commission that he considers them less liable to breakage than steel wheels because of the many parts of which the latter is composed. True, the Pennsylvania Railroad make their own wheels and do not try to buy them at less than the price they pay per pound for their brake shoes.

It does not establish the fact that all chilled wheels are poor because some are. What an absurd thing it is to condemn all the makers of chilled wheels before the public because some of them, in compliance with the inevitable, make wheels to meet the price they get. I am not excusing the maker who does make wheels that are not what they should be, but after all, is he, or is the man who will only pay a price that admits of the poorest material, to blame? And anyway, should the railroads, who do pay a proper price, and the wheelmakers who make good wheels, stand convicted before the public of using and making an inferior wheel because somebody else does it? There has been too much of that sort of thing, and the result is that many railroad men, who have not time to investigate the facts, and the public both say "chilled wheels are unsafe."

I am not writing this letter to drum up trade or advertise what we have done, but to ask, in all fairness, that so prominent a journal as yours does not put itself on record with statements that do injustice to anyone.

We have an accurate and perfect record of each individual wheel in a series of over six hundred thousand wheels put in service during the past seven years on the New York Central, Canada Southern, Canadian Pacific, Intercolonial, Erie, New York, Ontario & Western, and many other leading railroads, and furnished to car builders for use under new cars—Murray, Dougal & Co., the Allison Manufacturing Co., and other companies—and to the Brooks Locomotive Works, Rogers Locomotive Works, etc., all of which have been used in every kind and species of service, and out of this entire number there has never been one case of breakage in service. These wheels have been subject to every hardship that can be imposed on a car wheel. Now, if records like that do not count for something from the standpoint of safety, I would like to know where to look for it. There are other makers of chilled wheels who could produce records that would easily prove better ones than can be found for any steel wheel. In a statement published recently it was shown that in the last five years on the state railroads of the German Empire there had been twenty thousand failures from the breakage of steel tires in that period. New brooms always sweep clean. The steel wheel has been a comparatively new thing in the United States. It ought to be a good thing, costing as it does six or eight times as much as the chilled wheel. It is all very well for people who have not time to investigate to say "We will use steel wheels because it is said they are safer" and to put five or six hundred dollars into the wheels under each car when they refuse to pay over fifty or sixty (net) for chilled wheels for the same purpose, no matter if what they get is of the poorest quality. That is not good management from any standpoint—safety, economy, or any other. If the Pennsylvania Railroad, a company that has never stopped at any expense to get the best of everything, openly prove by their practice and profession that chilled wheels properly made are the safer, that is one pretty good proof that the wheel question is by no means solved when the railroad manager responsible for a broken wheel can say "I bought steel wheels because it is said they are the safest and because they are the most expensive and presumably the best." Our railroad managers are in duty bound to furnish the public with the safest possible service and no matter whether that involves one thing or another they do not discharge their obligations by following opinions not founded on facts. P. H. GRIFFIN.

Automatic "Automatic" Car Couplers.

Editor National Car and Locomotive Builder:

Being to some extent interested in a question that undoubtedly has given the railroads of our country more annoyance and perplexity than all other problems which they have had to wrestle with, viz., the coupler question, I desire a little information from some of the many readers of your valuable journal in regard to this matter. I believe it is settled that the reason why this question has caused our railroad companies so much trouble and expense of late is the fact that the question of human life and limb is more closely to be considered in connection with this branch of the business than any other part of it. A number of the States have already enacted laws in regard to safety appliances for freight cars, with a view to hastening the settlement of the question and thus put a stop to the wholesale slaughter of the young and vigorous men who are employed to handle the present deadly devices. I have compared the laws recently passed by the several States and find them identically the same, reading that after a certain time, which differs a little as to States, all cars must be equipped with "safety or automatic couplers." It does not, however, leave it in that shape, for every man to judge for himself, or every railroad company to judge for itself, but goes on and defines what it means by safety automatic couplers by saying "such as will not necessitate the going between the ends of the cars to couple or uncouple them, but operated from the side of the car." This seems to me so plain there is no chance for any technical quibbles. Our national congress will undoubtedly enact the same law at its next session. It cannot pass any other than a plain, stringent law. Statistics show that about 20,000 able bodied men are killed and crippled annually by handling couplers and brakes.

Now, the above being the facts, what I wish to know is, whether there is a man or company that has a coupler that will comply with this law to the letter, and if so I would be pleased to know the name of it.

If there is a coupler that does comply strictly with the laws, and everything else being equal, why do not all the railroads of the country adopt and use it.

Suppose an automatic coupler should be iuvented that would fill all the requirements of the law to the letter, and be from 5 to 0 cheaper per car than the ones now in use, and being experimented with, also save one-fourth the time in handling, would the railroad companies adopt it universally?

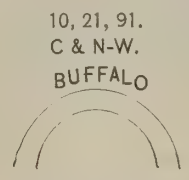
Is it reasonable to suppose that the railroads of our country will be compelled to make a change from couplers that kill and cripple 20,000 men every year, to one, or 50 for that matter, that kills aud cripples only 10,000, provided they can get a coupler that does comply strictly with the laws and save the entire number?

These are questions all railroads are vitally interested in, and they should be carefully considered. H. C.

Rule IV.—Clause 4.

Editor National Car and Locomotive Builder:

In the revised code of rules for interchange of cars, the 4th clause of Rule IV. reads as follows: "Wheels applied must be marked on the inside with the date, the initials of the road doing the work, and the place where the work is done," something like this, the place next the hub, the road next, the date next, between the brackets.



If it is necessary to have a uniform system of marking which applied to foreign cars (which no one can deny), why is it not just as necessary to have a uniform or the same system in applying wheels by owners? Do not the owner's cars become foreign when away from home? Then why is it not as necessary for the foreign road that removes a wheel that owner has applied to have a uniform marking, from which to make his report or record to owner, as it is for owner to have a uniform marking to make record from wheels he has removed from his own car, that a foreign road has applied?

Isn't it about 6 of one and half dozen of the other?

Is there a car superintendent who has not received wheel bills from foreign roads with the stereotyped phrase, "no shop marks found?" Is not the reason for this too often used phrase traceable to the shop marks and dates of the owner being in such an out of the way place as not to be found, and, if found, so illegible as to be beyond reading except by the owner, and they have been known to fail. Yet the same owner would no doubt consider it impertinence to suggest to him a more legible system of marking his wheels. If a majority of car builders are agreed that it is necessary for a uniformity in making wheels, both by the owner and the foreign road applying, then what is the reason the M. C. B. association should not take up the subject with a view to adopting a uniform system for all wheel marking?

An expression of opinion from those interested, through the NATIONAL CAR AND LOCOMOTIVE BUILDER would be interesting. J. D. Mc.

A recent special dispatch from St. Joseph, Mo., says: Railroads here are compelled to refuse ordinary freight in order to keep cars enough to handle the immense volume of grain that is steadily pouring in here. Yesterday an effort was made to ship out 90 cars of bricks over the Rock Island, but the road refused to take the freight, as it was barely able to handle the grain trade. The average shipment from here is 350 cars per day, most of the grain being wheat. The bulk of the shipments goes to Chicago and St. Louis.

Car Lighting.

At the October meeting of the New England Railroad Club, Mr. F. D. Adams introduced the subject of car lighting. He could look back to the forties, when they used whale oil for lights. Then came kerosene, and that for a time gave place to candles, which were abandoned for good cause in favor of mineral sperm oil. By the use of a good burner this can be made to yield an excellent light, the most brilliant that has ever been introduced into a car. The objections to oil lighting are mostly on account of dirt and smoke.

His road had run two trains for two years lighted by electricity at enormous expense and without making a particularly good light.

The Pintsch light is probably being introduced now to a greater extent than any other in America, and it is an excellent light, clean, easily cared for, and perhaps not exorbitantly expensive. I have a memorandum of the expense pertaining to this light. I have gone back to 1876 so as to make a comparison between the cost of the present Pintsch light and the oil lamps or candles. At that time the cost of lighting candles was .59 of a cent per hour for each candle, candles costing 24 cents per pound. The cost of mineral sperm oil, which was being introduced at that time, was 55 cents per gallon, and the cost per lamp, which was much smaller than the lamp used now per hour, was .64 of a cent, but the oil gave about eight times more light than the candle. At the present time this same oil costs only about one-seventh as much as in 1876, so that the same lamp would cost now only about .09 of a cent per hour. At this time the Sherburn lamp, or the lamp made by Page Bros. & Co., which is a round wick lamp and consumes more oil, gives a light of about 60 or 70 candle power to each burner, the cost of each burner being .18 of a cent per hour. The average cost of lighting 12 cars with 116 four-flame lamps (464 flames) for seven months, from Dec. 1 to June 30, furnished with Pintsch gas, was $185.66 per month, the highest being for December, $280.66, and the smallest being for June, $84.28. The average consumption of gas per hour for each flame was 1.65 feet; the average cost for each was .83 of a cent per hour. You will see that the average cost of the gas is about four times that of oil, with no more light for the same number of flames, but there are some great advantages in the gas over the oil, it being entirely clean, while oil is liable to drop on the seats and clothing of the passengers; there are no smoky lamps, no smell of oil, and the lamp cannot be manipulated, either by trainmen or passengers, and there is a uniform, steady light, provided you have gas enough to make the run over the road.

For myself, I should prefer that light in the hall to any other I have seen, if everything could be done that should and might be done to keep the lamps in proper condition; I think all must admit that the Sherburn lamp with the round wick burner gives the most brilliant and best light. It is impossible to get men to take care of oil lamps as they should be cared for to make them clean and neat; they require much care and time, while gas is no trouble at all; you simply turn it on, and it is regulated as to the flame just as you choose.

A discussion of some length ensued which was participated in by Messrs. Coghlan, Lauder, Robert M. Dixon, Adams, Chamberlain, Butler and Richards. The trend of the discussion was to the effect that Pintsch gas is the best means of lighting cars.

New Speed Indicator.

A simple form of speed indicator for locomotives has been designed in Germany. It is offered as a substitute for some of the apparatus of this class now in the market, and, though less accurate, its simplicity is thought to recommend it. The device comprises a clock dial with two index fingers, the dial being divided into ten equal parts. One of the index fingers is driven by ordinary clockwork, and makes one complete revolution per minute. The other index finger is in communication with one of the driving axles of the locomotive through a system of bevel wheels and an endless screw and worm wheel. The proportions adopted are such that the index makes one revolution for every kilometre passed over by the engine. Each division on the dial, therefore, corresponds to a hectometre. or about 328 feet. The indications of the two index fingers thus afford a ready means of determining the rate of speed of the locomotive, and a comparison of their speeds over the clock dial enables one to make, at a glance, at least a rough approximation to the engine's speed. If both index fingers travel over the dial at the same speed, then the speed of the locomotive is exactly 64 kilometres per hour. If the minute hand moves more quickly than the other, the engine speed is less than this. If, however, the distance index moves more quickly than the minute index, then the engine speed is greater than 60 kilometres per hour. The apparatus is said to have given good results in recent trials.

The committee on safety appliances, appointed at the last annual Convention of Railroad Commissioners, will hold a meeting on Nov. 10, at 10 o'clock A. M., in the rooms of the Chamber of Commerce in the Mutual Life Insurance Building, 34 Nassau Street, New York City, to consider the subject of safety appliances, in compliance with the resolutions adopted at that convention. It is the wish of the committee that all organizations of railroad employés or officials shall have representatives at this meeting to give their views or recommendations upon the subject of Federal regulation of safety appliances. The committee consists of Messrs. George C. Crocker, Chairman; James C. Hill, Spencer Smith, William E. Rogers, John H. King and Edward A. Moseley, Secretary.

Pullman Centre Vestibule Electric Car.

The problem of rapid transit has long been one of grave concern in all our large cities. As population has increased, the demand for speedy facilities for travel from place to place has kept even pace.

Our elevated roads and our electric, cable and horse car companies have heretofore found no other method than to increase their car equipment, and to add to the length and frequency of their trains, until the inevitable outcome would seem to be that the street covered by their lines must be given over entirely to their use, to the exclusion of all other vehicles of traffic.

The question is of vital moment to the people of Chicago in view of the transportation facilities which will be required for the millions who will throng our streets during the World's Fair.

It is believed that the problem is practically solved by the latest improvement by the Pullman Company in car construction, which is a street car with upper seats and a central vestibuled entrance and double stairway on each side. By its use every street car line will be able to double its carrying capacity with the same number of cars, with increased comfort to passengers, and without additional cost of operations.

This is without doubt the "coming" street car. It is so adapted to the purposes which it seeks to accomplish that in the near future the Pullman car will be as familar on our streets as it is now on all our highways of travel.

Our engravings illustrate the inside and outside of this novel form of street car designed by Mr. C. L. Pullman and Mr. H. H. Sessions. The length over all is 33 feet 8 inches, width over posts, 7 feet 4 inches; seating capacity, 40 passengers inside and 40 outside, i. e., on the upper deck.

The car, which has circular ends, is sheathed outside with narrow strips the same as the ordinary passenger coach; the inside finish is of mahogany with quarter sawed oak ceiling, decorated; the glass in windows is crystal sheet, while in the doors is French plate, embossed; mirrors are placed in the upper deck and on each side of the coors; the car is provided with spring seats and backs, covered with tapestry. In addition to being lighted with electricity, oil lamps are provided in each compartment. The car is provided with two gates, each gate equipped with a seat. The wheels are Allen, 30 inches, with steel tires. The motive power is furnished by two Westinghouse single reduction motors of 25 horse power each, one motor on each truck.

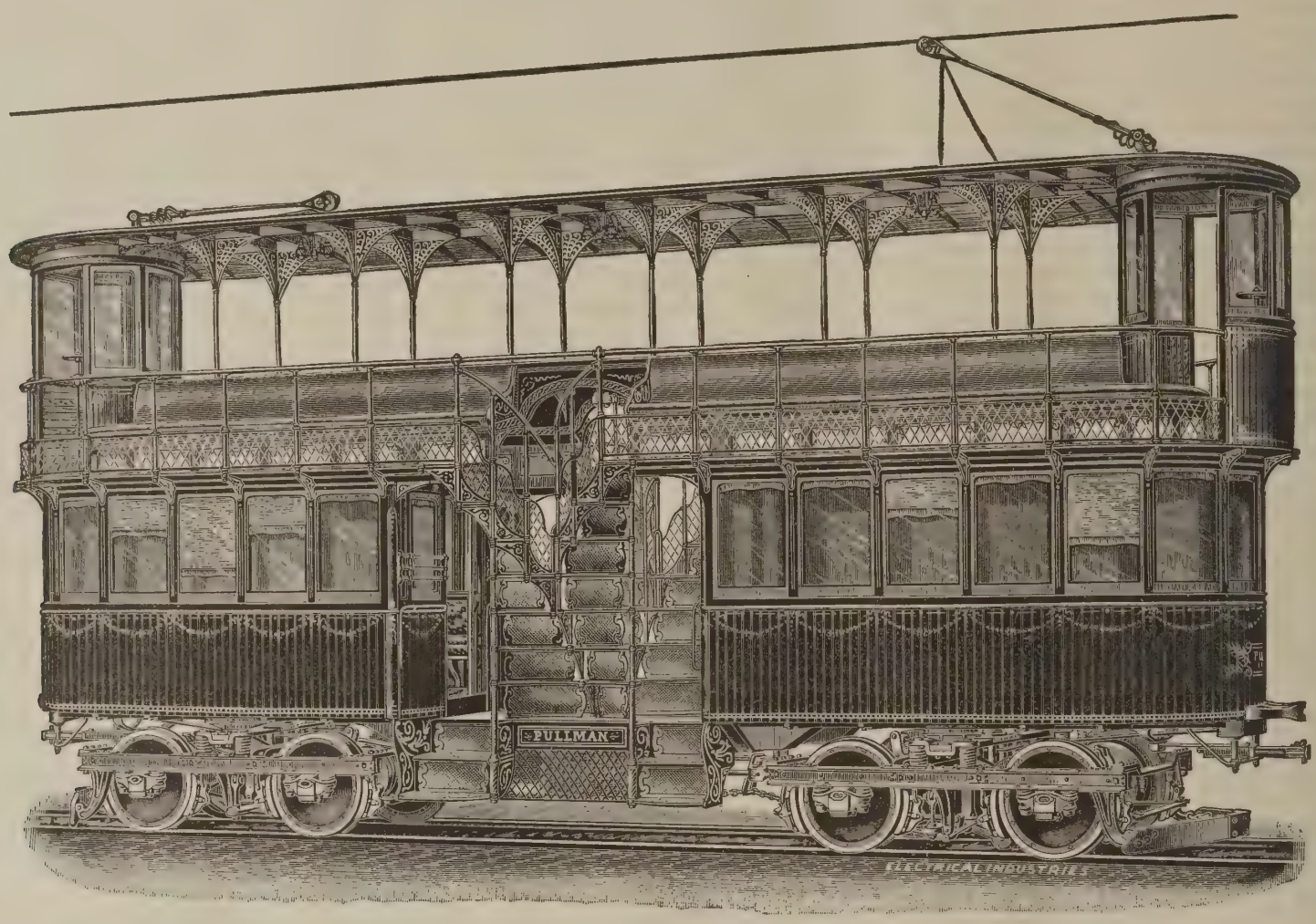
A maker of wood-planing machines in England has done a very sensible thing in putting a kind of box rack over the table of a chain-fed surfacing machine, so a pile of pieces can be laid in the rack, and the lower one fed into the machine until the whole pile is gone. This not only does away with putting in a piece at a time and holding it in the hands until the rollers nip the end, but also insures regular and continuous feed for short pieces which is nearly impossible in feeding by hand.

Highway Crossing Accidents.

When a danger that admits of remedy becomes conspicuous, it is always wise for railroad companies to take action of their own accord without waiting for the prod of legislators. There is beginning to be a strong feeling about the number of accidents happening at highway crossings, and the railroad companies will be wise to heed the mutterings on the subject. One of the most influential of the New York daily papers has the following to say on highway crossing accidents:

Attention is once more called to the danger of grade crossings of railroads by the killing of three persons on Staten Island. It is out of the question, of course, to abolish such crossings by wholesale, but it is plainly the duty of the lawmaking powers to heed the repeated recommendations of the Railroad Commissioners that no more such crossings be constructed in the State; and some steps might well be taken looking toward the gradual reduction of those already in existence. Furthermore, the danger of such crossings can be largely reduced by compelling the adoption of a device, which some railway companies are now using, by which at every crossing a bell is set ringing automatically whenever a train is within a few hundred feet on either side, and kept ringing until the crossing is cleared. The sound of the locomotive bell and whistle is often not plainly heard, but the sharp and continuous ringing of an electric gong at the crossing itself could not escape attention, and would unquestionably prevent many accidents. It would be no hardship to compel the railway companies to incur the small expense which the adoption of this system of signaling would involve.

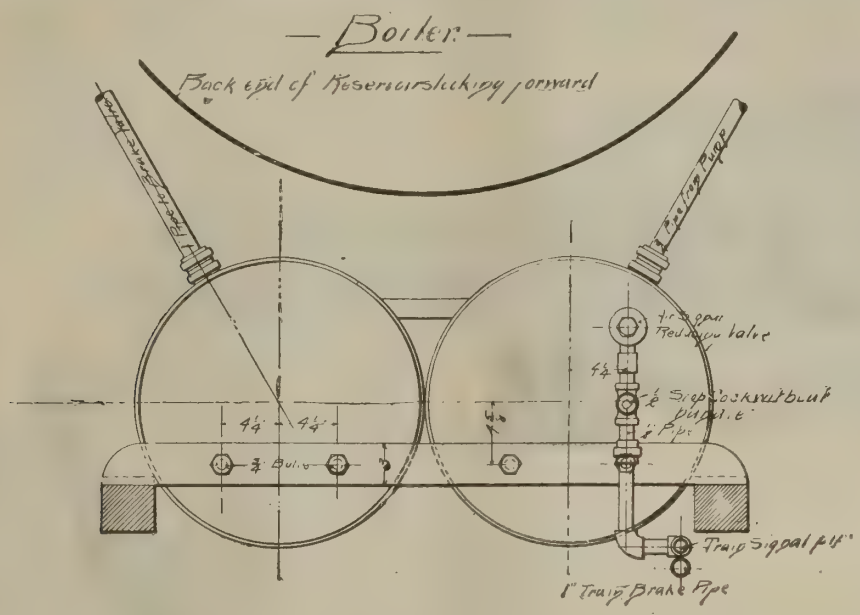
The car works of Messrs. James Harris & Co., at St. John, have been turning out substantially built box cars for the Canadian Pacific, for the last month, at the rate of about 25 cars a week. Last week the contract, which was for 150 cars, was completed.



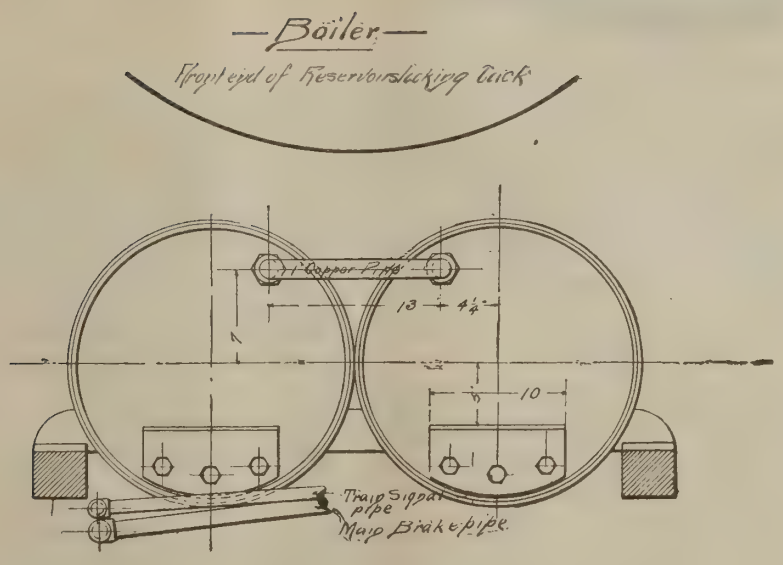
PULLMAN VESTIBULE ELECTRIC CAR.

Double Air Reservoirs.

With the growing increase in the length of trains equipped with air brakes and with pipes and joints more or less out of order, complaints have often been heard that the ordinary air pump is unequal to the duty of maintaining a supply of air sufficient to release the brakes after they have been applied. Those most familiar with brake apparatus are aware that the real trouble is deficiency in the storage of air in the main reservoir. In many cases the main reservoir is too small for the demands put upon it. Several railroad companies have adopted the plan of using two main reservoirs, which is the proper remedy for the difficulty, A variety of plans have been tried for locating these reservoirs on locomotives where room is scarce. On some roads one reservoir is put between the frames opposite the guides and one under the footplate. On others one reservoir is put in the tank. There is a good deal of inconvenience in putting the reservoirs in different places. For those who are thinking of increasing the facilities for air storage on the locomotives, we submit the annexed engraving, which illustrates a plan of double reservoir designed by the Westinghouse Air Brake Co. As will be seen by the cut, two air drums are placed between the frames behind the smoke box, and are there secured as safely and conveniently as the single reservoir. There is ample room for them, they are well raised above the track and are far enough away from the boiler to be convenient for examination.



Arrangement of Air Brake and Signal Fixtures.



THE representatives of the Brotherhood of Railroad Conductors and Order of Railway Conductors, in conference at Cedar Rapids, Ia., have decided to consolidate both organizations under the name of the latter, and to work for the general federation of all train service organizations.

THE suit of the State of New York against the New York, New Haven & Hartford to recover a $7,000 penalty for violation of the state car heating law, has progressed one stage further in the courts, and the decision against the company is again affirmed; but the road will doubtless appeal to the United States Supreme Court in order to have the question of interstate commerce settled.

Extraordinary Freight Locomotive Mileage.

Those familiar with the operating of trains on the New York, Chicago & St. Louis, of which Mr. John Mackenzie is superintendent of motive power, are aware that unusually great mileage is obtained from the locomotives in use. For some time we have been trying to secure the exact figures of engine mileage on this road for a few years back and are now pleased to be able to supply this interesting information through the annexed table. The extended mileage secured is not only highly creditable to the locomotives used, which were all built in the Brooks Locomotive Works, and to those having charge of them, but it also furnishes the best kind of testimony respecting the handling of trains by the operative department. When freight engines are able to average more than 4,000 miles a month on a single track road it indicates that the train dispatching is particularly efficient.

Concerning the different classes mentioned in the table, Classes F and H, which show the best results with coal per car mile, were used principally upon the light grades, or what is known as the 2d District, between Conneaut and Bellevue. The Class G has been used upon the 1st District, between Buffalo and Conneaut, where for the first 50 miles there are very heavy grades, running as high as 60 ft. to the mile. The Class I engines are used on the division between Chicago and Fort Wayne, where the grade runs up to 45 ft. per mile. In the Class I engines the pounds of coal per car mile being shown heavy is caused probably by the fact that the engines were comparatively new and were run for several weeks with light trains, and all the coal used for preparing them for regular service is charged up in this statement. In evidence of this several of this class of engines ran as low as $3\frac{1}{10}$ pounds of coal per car mile.

The interesting point in the statement is the mileage made. For five years five months Class F engines have averaged over 4,100 miles per month; Class G engines have averaged over 4,200 miles per month for three years five months; the Class H engines have averaged over 5,000 miles per month for one year two and a half months. This is a very good showing for the locomotives, and this statement is not taken from any special engine. The average mileage of the entire equipment for the last three years was, in 1888, 45,398 miles per engine; in 1889, 45,374 miles per engine; in 1890, 49,260 miles per engine.

In looking at this statement we must remember that this is all classes of engines—switching, passenger, work and freight. The average number of miles made by freight engines has been over 5,000 miles per month, or, if we take the Class G engines, which are the 19–24, the average mileage of 15 engines is 59,965 miles. This company has some individual locomotives whose performance is very much better than that given. For instance, we have one of the Brooks 17 × 24 61-inch wheel centers, running between Fort Wayne and Chicago, making 304 miles every day. As an experiment to see what could be done they turned this engine out of shop Jan. 25, 1890, and up to June 30, 1891, 17 months, this engine had made 126,019 miles, and is still on the run. This is an average of over 7,400 miles per month. The average train hauled by this engine is four cars. She is run by two sets of enginemen. This engine lays over at Chicago at nights, and is required to back out from the depot to the roundhouse, and back to the depot in the morning, a distance of 10 miles, which is not credited to the engine mileage, as the performance sheet requires actual time card mileage only.

PERFORMANCE OF ENGINES.

Engine.	Class	Engine miles.	Car miles.	Repairs.	Tons coal.	Cost of repairs per mile.	Cars per train.	Lbs. coal per car per mile.	Time included. Years.	Months.
19 × 24 ten-wheeler 37	F	270,112	9,156,227	9,895.16	16,245.0	$.037	33.9	3.55	5	5
" " " 64	F	258,892	7,944,865	10,260.61	14,749.6	.04	30.7	3.71	5	5
19 × 24 Mogul 78	G	167,757	4,936,100	2,946.99	9,738.2	.017	29.4	3.94	3	5
" " " 82	G	172,188	4,985,472	2,318.56	10,417.3	.013	29.0	4.18	3	5
18 × 24 " 85	H	72,406	2,329,587	1,026.42	4,423.5	.014	32.2	3.80	1	2½
" " 87	H	72,712	2,315,026	918.39	4,292.5	.013	31.8	3.71	1	2½
18 × 24 ten-wheeler 89	I	14,750	367,190	104.66	753.5	.007	24.9	4.10	0	4
" " 90	I	13,810	372,138	96.03	730.2	.007	26.9	3.92	0	4

Work at Pullman.

In regard to new equipment now in construction in the Pullman Works, we are advised that they have at present in hand the following orders:

STREET CARS.

Six closed motor cars for the Sperry Electric Mining Machine Company, of this city, for service on the Youngstown Street Railway, at Youngstown, O.

One car for the Illinois-Judson Power Company, for use with an air motor.

Two closed motor cars for the Union Manufacturing Company, of Champaign, Ill., for service at Defiance, O.

One closed motor car for the Elgin City Railway Company, of Elgin, Ill.

Fifty closed motor cars for the West End Street Railway Company, of Boston.

FREIGHT AND PASSENGER.

Seventy-nine passenger cars for the Chicago & Northwestern Railroad Company.

Eight passenger coaches (four of which are to be vestibuled for the Illinois Central Railroad.

One private car for the Chicago & Eastern Illinois Railroad Company.

One thousand five hundred gondolas for the Philadelphia & Reading Railroad Company.

Fifty refrigerator cars for the Baltimore & Ohio Southwestern Railroad Company.

One hundred fruit cars for the Illinois Central Railroad Company.

Ten caboose cars for the San Antonio & Aransas Pass Railroad Company.

Twenty-five ore cars for the Fremont, Elkhorn & Missouri Valley Railroad Company.

Three hundred box cars for the Newport News & Mississippi Valley Railroad Company.

In addition to the above they have in hand the building of a number of new sleepers of their latest design for various lines of service.

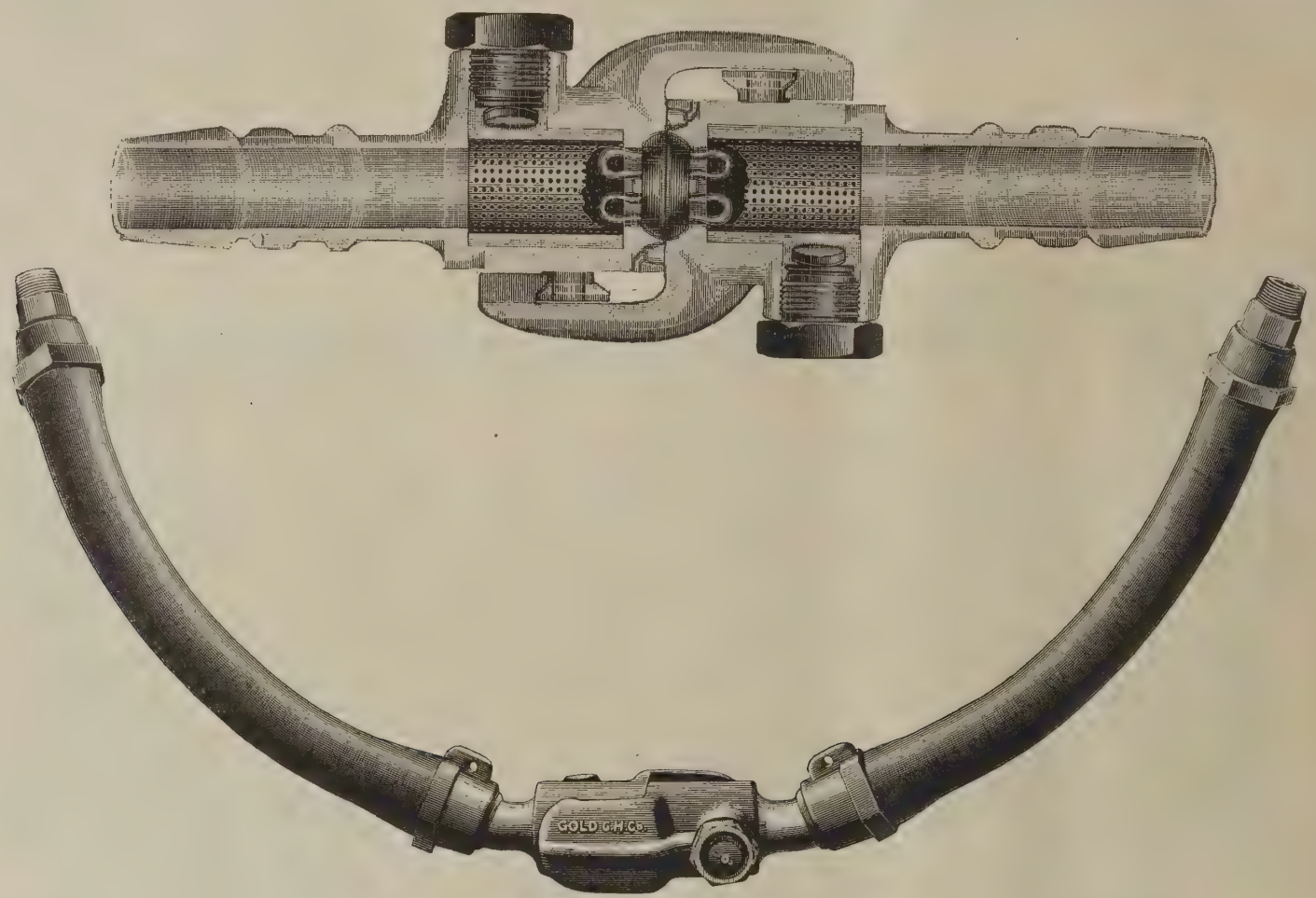
The Southern and Pacific Refrigerator Car Company is reported as doing an extensive business in their new refrigerator car. Their claim of consolidating three cars in one is fully justified, as they can be used as a fruit car, grain car and as a refrigerator car.

A feature is using the cars for the transportation of fruit, being so constructed that the ventilation is governed at will. They are equipped with grain doors, and protection for the ice tanks, and all things considered are ingeniously and well constructed. The company's offices are at Chicago, Chamber of Commerce Building, Suite 1,307. Mr. Critt A. Cox is president and E. D. Leach, secretary and treasurer.

Gold's Universal Straight Port Steam Coupling.

The annexed engravings give an outside and a sectional view of the Gold Universal Straight Line Steam Coupling for railroad cars. The general design of the coupling can be very readily understood by a study of the engravings. Each body is made of malleable iron and has a nipple or tubular shank over which the hose is drawn, to insure the bodies locking firmly together when coupled.

On the side of each body a spindle or stud is cast, and the roller shown is placed over the stud, after which the stud is countersunk down over a countersink made in the roller. In this way, when the lugs on coupling bodies engage with the rollers, they turn on the studs when coupling, no wear takes place, and the friction is reduced to a minimum—a very important point to be considered.



GOLD'S STRAIGHT PORT STEAM COUPLING.

On the other sides of the coupling bodies are the locking arms or lugs shown, which project beyond the end of the body, and are formed with a hook adapted to engage with the projecting rollers and stud on the opposite side during the act of coupling. To couple, the heads are brought together, so that the locking projections on either side engage with one another; then the bodies are tilted downward, bringing the seats together.

The head of each body is made in the form of a spherical socket to receive the seat, having sockets for receiving pivot of seat on each side of the head, and serving to guide the heads together when being coupled.

The special construction of the seat is as follows: Each seat is made of the best asbestos composition, formed externally as a segment of a sphere, mounted in a tubular thimble of metal or other material. This thimble is made with two opposite guide fingers, or stop projections, which project inwardly and engage the base of the socket in coupling head. This limits the movement of the seats.

The seat is loosely pivoted on the horizontal axis of the spring, which occupies a horizontal plane, and extends from the seat inwardly through the opening in the head.

The spring is pivotally connected to seat, and constructed to engage the head and hold the seat to position. It is formed in loops; the outer loops engage interior of head, and the intervening loop is for pulling out, when the seat needs replacing, or for other reasons.

By the ease in removing seat the interior of the coupling body is rendered easily accessible. The metal thimble prevents any contraction or pulling seat out of shape, and provides a perfect steam passage at all times.

A fine strainer, as shown, is inserted in each coupling body, and is kept in position by its own spring movement and the spring on the seat. This prevents any scale from being blown into traps to choke them up.

Among the distinguishing points and claims made for this coupling are:

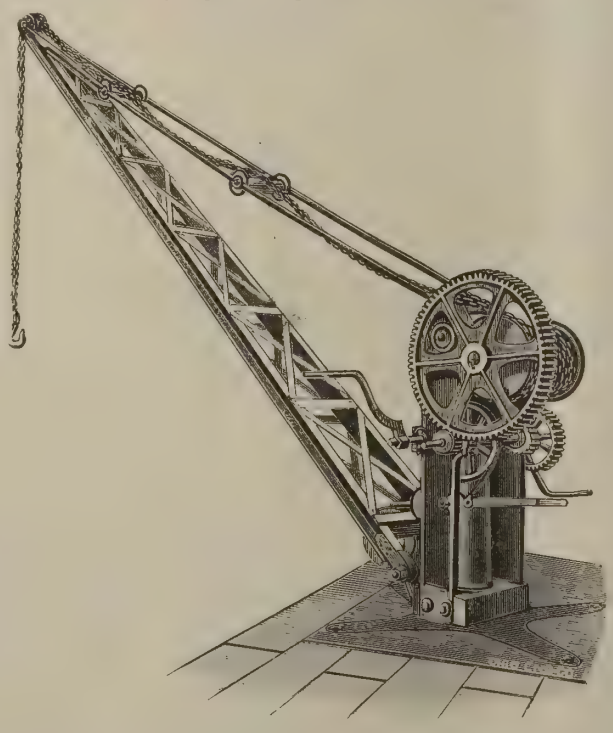
1. This is a perfectly "straight port" coupling.
2. The compensating faces are the most simple to adjust, remove or replace of any steam coupling in use.
3. The compensating feature of the faces insures an absolutely tight joint and allows for universal motion of couplings with least possible wear or friction.
4. This coupling may be used with traps or not as may be desired. Special attention is drawn to the new construction of trap to be used with the Universal Coupling.
5. The Universal is light, very durable and cheaper than any similar steam coupling on the market.
6. Uncouples automatically as cars pull apart; easy and smooth to couple.
7. Will couple and make steam tight with any coupling of its type, including the "Sewell."

This steam coupling is owned by the Gold Car Heating Company, New York.

One year ago Howe, Brown & Co., limited, opened a steel warehouse in Chicago, at 228 Lake Street, under their own name, with Edwin S. Jackman as manager. Their rapid strides toward the leading position in the Western market during this short period have occasioned much favorable comment among the trade. One railroad after another has adopted their special tool steel, and their machine shop trade has grown so fast as to compel them to greatly increase their stock. It would seem that this old firm (formerly well known to the railroads and manufacturing concerns as Hussey, Howe & Co., Limited) had only to enter the Chicago market and announce that fact and prosperity and success was assured from the start. They have almost abandoned the open hearth business, and are now paying special attention to the manufacture of fine cast steel for tools. During the recent long depression throughout the country no signs of dullness could be noticed at their Lake street store, where it was constant activity and rush. Howe, Brown & Co., Limited, may justly claim to have been the first steel concern in the United States to make crucible steel successfully, and it is evident they are unwilling to occupy second place now. The quality of their material and their broad gauge business methods are, to those who know James W. Brown, the chairman, but the reflection of his ideas and policy.—*Iron Age.*

Phenix Crane.

The above engraving represents a 2-ton crane, without rotating gearing. All other sizes have rotating gear. Each crane has single, double or treble-purchase gearing, according to the lifting capacity required.



Loads can be lowered either by brake or hand-cranks, as desired. The jib has a fixed radius.

The central post is of wrought iron, securely fixed into a substantial cast iron foundation plate. The jib is made of channel bars, thoroughly braced, and supported from top of centre post framing by substantial tie-rods.

By adding a second drum and the necessary gearing, we make these cranes with variable jibs.

The general arrangement and design of these cranes is similar for all sizes, differing only in the proportions.

We furnish these cranes all complete, with all necessary through foundation-bolts and bottom plates, etc.

In ordering or asking for prices, state maximum capacity, effective reach of the jib, etc.

The crane is made by the Phenix Iron Works, Cleveland, O.

O. K. Gardner, of Pittsburgh, Pa., manufacturer of car window balances for passenger coaches, etc., has removed his factory to Nixon and Manhattan streets, Allegheny, Pa.

The Indianapolis Cushion Car Wheel Company have offices in club room 9, Grand Pacific Hotel. Mr. Leach, the vice-president of this company, will have a complete line of sample wheels on exhibition soon.

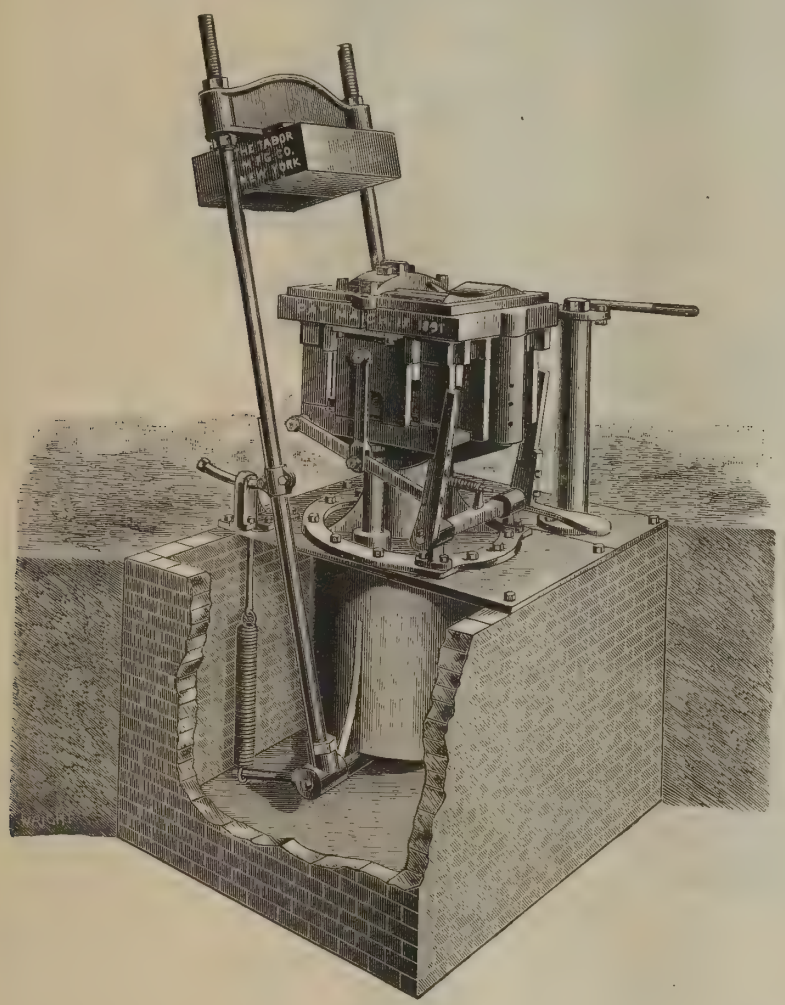
The Phœnix Steel Wire Broom and Brush Company, of Chicago, Ill., is not only one of the oldest (established in 1860 by M. C. Isaacs), but is one of the most reliable firms, noted for the uniformly good quality of the brushes they manufacture. One of their specialties is a wire track broom, which is attached to the locomotive and used for the purpose of clearing snow and ice from the track, and is in use by most of the railroads throughout the country. The demand for this broom is steadily increasing, as it is very effective for the purpose for which it is designed. This firm also makes wire brushes of all patterns and for all purposes. Their factory at Nos. 43 and 45 Franklin street is well equipped with the latest improved machinery for brush making.

That the paint and oil trade is about to become decidedly brisk is evidenced by the determination of the old house of John W. Masury & Son to follow the procession and begin again the work of active canvassing. For years this firm excelled in the manufacture of fine coach colors, railway varnishes and depot materials, but of recent years the company temporarily abandoned the "working the road," as commercial men say. John W. Masury & Son claim to sell colors and varnish to the first railroad of any importance, and for years supplied that trade with their goods. Their representative "along the line" is Mr. R. C. Hallett, whose heart is as large as his body and who can sell anything from a hotel to shoe varnish. Mr. Hallett knows every nook and corner of the paint trade and no doubt there will be some great results from his endeavors.

The following is the text of a special dispatch lately sent out to the press from Chicago: "A large body of United States troops arrived in Chicago this morning on their way to Arizona. They were ticketed by the Alton in New York, and proceeded to their destination at one o'clock this afternoon over that route. The Eastern roads over which they came refused to honor the Alton's tickets, and when the Alton sent forward a draft to pay for their transportation over that part of the route they refused to accept the draft, and put that road to the expense of expressing the cash." We have always considered that the boycott war waged by certain railroad companies against the Chicago & Alton was unwise, but the thing appears now to have descended to absolute imbecility. Could anything be more idiotic than the holding of passengers till one of the most solvent railroad companies in the country should send cash instead of a check? We expect to witness silliness in callow youth, but people expect that the running of railroads is done by men. It seems time that the Society for the Care of Idiots was looking after some of their flock which have escaped and found employment as passenger agents.

The Tabor Molding Machine.

Nearly every number of the technical journals of the day illustrate machine shop specialities in the way of doing better and cheaper work. The tools used in machine shop practice, such as lathe, planer, milling machine, drill press and all the countless attachments that go with these machines, have had their turn in the way of illustration, and as a result the machinist is familiar with the best and most modern tools obtainable. That this system of illustration is a benefit to the buyer there can be no question. One interested in improvements will give attention to an illustration of this kind when he would scarcely give in a thought if mailed to him in the shape of a catalogue. The reason is obvious. It rarely happens that the maker gives as good a description of his machine as that found in a well conducted technical journal. The catalogue reaches the few while the paper goes to the thousands, all of whom are interested in the subject.



TABOR MOLDING MACHINE.

The machinist has been bountifully favored in this respect when the founder has received scant attention. Illustrations representing foundry progress have been as rare as the descriptions of machine shop improvements have been abundant. This may be due to the fact that there has been less advancement in foundry practice; and it is possible that prejudice, founded on the belief that nothing can supplant the molder's rammer and his methods, may have had an influence.

It seems strange that so little attention has been given to foundry improvements by the technical press. It cannot be because the foundry is the least important branch of the iron industry, or because the business is not hedged in by sharp competition. The foundry is the origin of machine construction, and the better it is managed and the closer castings are made to pattern is the machinist relatively benefited; its business is quite as competitive as any branch of the iron trade.

With the belief that the foundry has not received its full share of attention from the press, we are glad to illustrate a new sand molding machine for metal castings, recently brought out by the Tabor Manufacturing Company, 111 and 113 Liberty street, New York, which possesses many new and interesting features.

The cuts show the machine in the foundry as set for work, with the floor cut away in one case to show the arrangement of cylinder below. The piston takes steam on the under side only, its weight being sufficient to return it promptly after ramming the mold. The piston rod projects through the cylinder head and supports the upper part of the machine, which consists of a table with lugs projecting upward and supporting the pattern frame upon which rests the patterns; the stripping-plate frame, directly over the pattern frame, and resting on it, to which the stripping-plate is attached; the stool-plate, supended to the stripping-plate frame and moving with it; side levers and tumbling shaft for tripping after the pattern is drawn. The pattern frame has an annular passage connected to the steam in the cylinder by means of a pipe extending through the piston rod. The object of this passage is to keep the patterns warm to prevent sweating and to assist them in drawing from the sand. The stripping plate frame is guided in two bored sockets in the front and back of the machine; these sockets have air holes to cushion the drop of the stripping-plate frame after it is tripped. The stool plate is really a part of the stripping plate frame below the pattern frame, and its object is to support stools or internal parts of the stripping plate used in holding green sand cores or heavy bodies of hanging sand when the pattern is drawn. The side levers are pivoted at one end to the table, and are connected in the middle, by links, to the stripping plate frame, the outer end being free. The tumbling, or tripping shaft, is in front, with arms projecting upward along the line of travel, followed by the free ends of the side levers; on these arms are stops of suitable length, which engage the ends of the levers on the downward motion to draw the pattern. The ramming head is carried on the strain bars at the side, which are trunnioned on a shaft below and bolted to the cylinder. Springs are connected so that as the head is moved backward the springs are put in tension and made to counteract the weight. The ramming head is usually of wood, roughly cut out over the pattern to avoid too hard ramming on the high places. This block may be readily changed to suit any size flask not beyond the capacity of the machine. The stops on the tripping arms can be changed to suit any draft within the range of the machine. The steam pipe enters the machine at the bottom, and from the throttle to the cylinder serves as exhaust pipe.

The operation of making the mold is simple. The half flask is put on the machine, with the sand box as an extension to hold the sand that is compressed, and both are filled with sand, when the ramming head is brought up over the flask, and against stops to prevent it going too far, and the throttle valve opened; the upward motion carries the sand up against the ramming head, and the sand is compressed to the top of the flask; the throttle is then closed, the same motion opening the exhaust, and the flask descends; the stops in the meantime engaging the free ends of the levers which reduce the downward motion of the striping plate one-half, while the motion of the pattern is not arrested; when the piston has finished its descent the pattern is drawn; the ramming head is then turned back, the sand struck off the flask, and the flask ready to be taken from the machine. As the operator lifts the flask from the machine he steps on the treadle attached to the tripping shaft, which disengages the stops and the stripping plate drops noiselessly to its place, and the machine is ready for another half flask. The operation of making the mold is very quick. The writer has seen a complete half mold, as shown in the cut. made by one man in 10 seconds after the sand was in the flask. This time included taking the flask from the machine and putting on the floor for inspection.

The capacity of the machine we saw seems to depend on the number of molds that can be taken care of. When the makers claim that a man and boy can comfortably make 25 complete molds in 16-inch flasks, 10 inches deep, per hour, and shovel the sand, it would seem to any one who has seen the machine in operation that their estimate was none too large. As men work in many shops where piece-work is the rule, the output would undoubtedly be much greater.

The machine illustrated is at work in the foundry of The Samuel L. Moore & Son's Co., Elizabeth, N. J. It is fitted with two standard Christie brake shoes, and uses a flask 14 inches × 17 inches. A visit there would amply pay any one who is interested in good molding cheaply done, and he could see abundant cause for the faith the makers have in their machines.

Much stress is put on the feature of using the steam for warming the patterns. The fact that users of some machines keep gas jets burning under the patterns would indicate that warmth might be essential in some cases. At any rate nothing could come from the sand and leave a finer looking mold than the warm patterns we saw in Elizabeth.

Water or compressed air may be used in cases where it is desirable. Steam is preferable for various reasons; it is of great help in warming the patterns and it is much cheaper. It can nearly always be taken from the shop boiler, thus avoiding the expense of air compressor or pump and accumulator, with their attendant care and expense account. The pipes can be cheaply run to the machine, and as they come under the charge of the fireman or engineer the foundry is relieved of their care. The machine we saw at work in Messrs. Moore's foundry took its steam through 250 feet of pipe, and standing by the machine while in operation one might think compressed air was used, so far as any evidence of steam was seen.

These machines are at work making molds for cast steel knuckles, for vertical plane couplers, M. C. B., shaft hangers, oil boxes, brake shoes and a large variety of castings. They are especially adapted to car work, where cheapness is an important feature.

All the railroad companies having particularly fast trains have the principal bearings of their locomotives made of Ajax metal.

Mr. Thomas L. Johnson has made an engagement with the H. W. Johns Manufacturing Company as manager of the railway supply department at Chicago.

We are informed by the Consolidated Car-heating Co. that it has established a department for the application of the commingler system of heating to houses and factories. This department will be in charge of Mr. Edwin A. Smith.

From Aug. 1 to Oct. 15 the Gould Coupler Co., of Buffalo, turned out 83,125 links and 78,605 pins, 8,000 more links and 2,000 less pins than during the same period last year. In addition to this 5,000 axles were made for the Chicago, Burlington & Quincy,

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The Schoen Mfg. Co., of Pittsburgh, Pa., are very busy in the manufacture of their pressed steel specialties, the demand being so great for them that their present large factory is not extensive enough to enable them to keep up with their orders. They are about to build another the same size as the one they now have.

The equipment of 200 cars of the New York, New Haven & Hartford with steam heat, has just been completed by the Safety Car-Heating & Lighting Co., of New York. This company is also fitting many New York & New England passenger cars with its standard hot water circulating system in connection with which the Gibbs coupler is used.

Messrs. Watson & Stillman, of New York, have recently added 5,000 feet to their already large hydraulic machinery works, whereby greatly facilitating the production of railroad tools. The output of hydraulic jacks and car wheel presses during the last two years, has increased to such an extent that the adoption of this course was rendered absolutely necessary in order to keep abreast with their orders. From reports received as to the efficiency and superiority of this class of their manufactures the prospect is decidedly encouraging.

The favors of fortune are like steep rocks—only eagles and creeping things mount to the summit. As the eagle soars, so does the Egan Company, of Cincinnati, O., onward and upward. 'Tis to this great concern the wood worker is so largely indebted for the wonderful achievements in wood working machinery—ambitious always to reach the summit of perfection it has evolved the greater mechanisms that are so important to increase production and save labor. The eagle and the Egan Company are synonymous in that they reach the highest points in their performances.

The St. Charles Car Co. closed contract with L. S. and M S. Ry. for 10 combination cars (baggage and passenger), passenger end finished in mahogany and upholstered in leather. Spring delivery. With Pittsburgh and Lake Erie Ry., for two baggage cars of L. S. and M. S. standard. For the Toledo, St. Louis and Kansas City Ry., two chair cars, which will have buffet attachment and elegant meals will be served between Toledo, & St. Louis. These chair cars to be elegant and with all latest improvements for the comfort of passengers. In the line of freight work, the St. Charles people are working on 50 provision box cars for Armour Packing Co., 100 box cars for Cairo Short Line, 100 cars (box, flat and coal) for P. T. and A. Ry., and 300 60,000 lbs. capacity coal cars for the Texas Pacific Ry.

Fay's Latest Sand-Papering Machine.

This machine is designed to sand-paper plain surfaces of material for furniture, pianos, organs, wagons and cars; for panels, doors, or any class of work requiring a perfect surface either for varnishing or painting. It is a very heavy and substantial machine, combining in its construction the latest improvements which an extensive experience could suggest. We make it to work 30, 36, 42, 48 and 60 inches wide.

The drums are three in number, made of steel, upon which the sand-paper is placed and graded according to the work to be done. The first drum carries a coarse grade of paper, the second drum a fine grade for smoothing, and the third drum a finer grade for giving the material the polished surface. Each drum has an oscillating or vibratory motion laterally across the material to prevent the formation of lines which would result if the revolving motion was direct. They are equipped with a device for placing the sand-paper about them and giving it the proper tension in the shortest possible time.

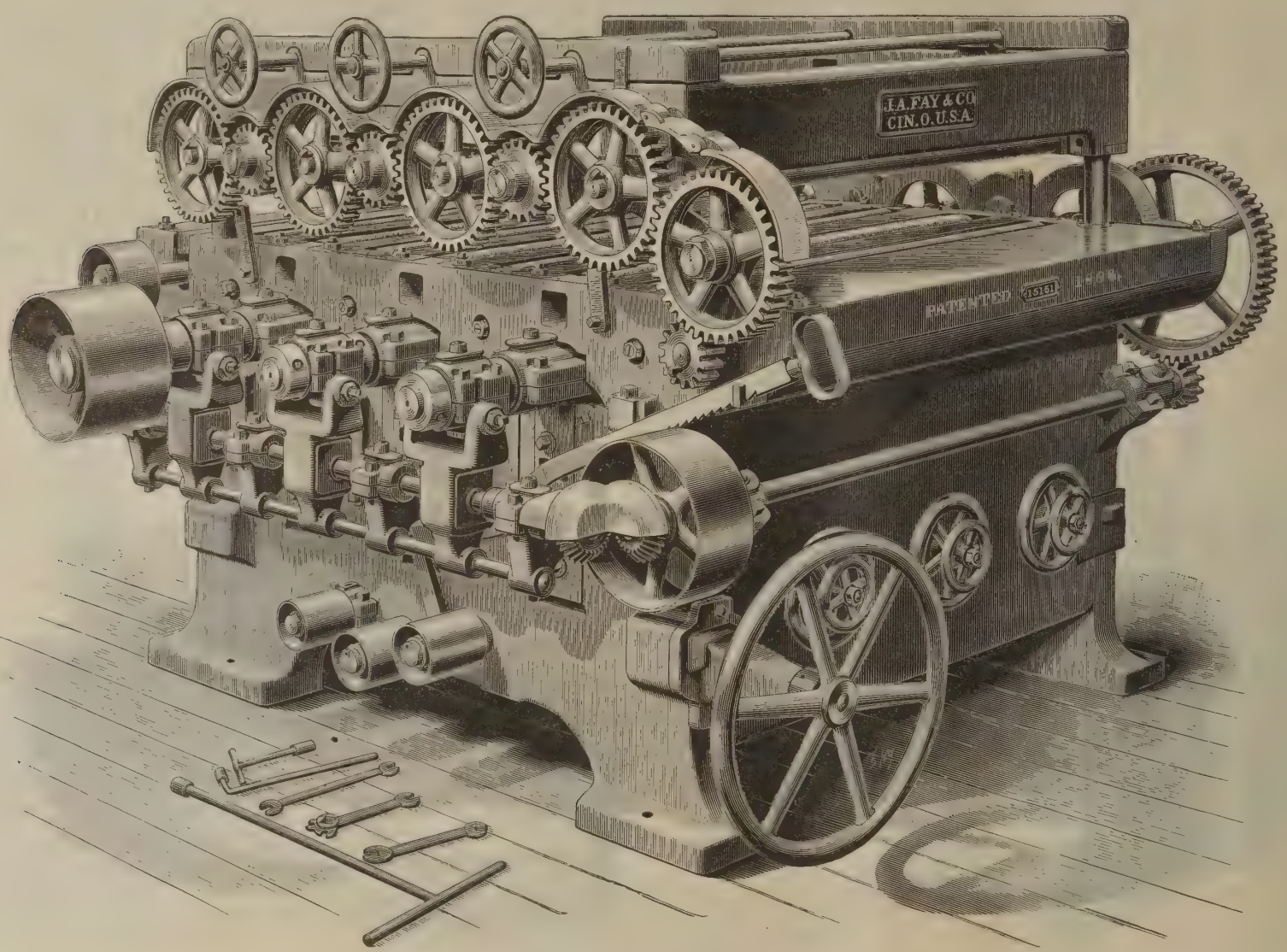
The drum shafts are steel, $2\frac{1}{16}$ inches in diameter, and revolve in heavy bearings, gibbed to the sides and with adjustments to lift both ends of the drums at once, or either end separately for alignment. The drums can be easily removed by raising the entire roller and bed frame, which opens a space directly over them sufficiently to lift them out and over their bearings. This raising device is operated by the large hand-wheel by which the screws at the four corners of the machine are turned, the screws resting on friction rollers giving very easy motion in raising to any height. The adjustment of the drums for the difference in heavier or lighter cutting is done by the movement of the three hand-wheels at the end of the machine.

The feeding-rolls are eight in number, four above and four below the platen, driven by a train of heavy expansion gearing, and giving a very powerful feed. They are placed so the material will pass between the upper and lower sets and open to receive material 8 inches thick. The lower rollers are placed one on each side of each drum, each roller is located in a separate bed-plate which is adjustable with the roller and the roller having a separate adjustment from the bed-plate. Each bed-plate can be set to gauge the amount of cut to each drum, or all the bed-plates can be set in line and the drums set to the cut desired above this line.

The upper rolls are mounted in a frame over the corresponding lower rolls. The pressure rolls are three in number, one over each drum, to hold the material firmly to them, and are separately adjustable by the hand-wheels shown in front, which operate worms and worm gears. The feed is governed by a double belt tightener operated by a hand lever, by which it is instantly started or stopped.

A brush attachment is provided for cleaning the material as it passes finished from the machine. The countershaft can be placed either on the floor or under the floor as may be desirable, and when so placed the feed-belt is driven from a pulley on the countershaft. If it is desired to drive the machine from the countershaft placed overhead, the feed-belt is driven from a pulley on the first drumshaft. A shop number is attached to each machine, reference to which in correspondence will identify the class of the machine and the style of its construction.

A countershaft is furnished having tight and loose pulleys 14 in. × 8 in., and they should make 600 revolutions per minute. This machine was designed by and made by J. A. Fay & Co., Cincinnati, O.



FAY'S LATEST SAND PAPERING MACHINE.

Harry Toothe, of the Midvale Steel Company, is reported in the Denver, Col., *Tribune*, in a lengthy article, as expounding on the merits of the Midvale Company.

The Magnolia Anti-Friction Meta Company, of New York, having offices at Chicago, London, Berlin, Marseilles, St. Petersburg and Vienna, made greater sales and did more business in the month of September, this year, than they did the first 18 months of the company's existence, commencing several years ago.

The Marks Car Coupler, under the management of Mr. O. L. Baker, Cleveland, O., is meeting with good success, several railroads are using it. The cost of repairs from breakages is merely nominal.

The Phœnix Iron Works Co., of Cleveland, O., successors to W. H. Thompson, has recently been incorporated for the purpose of building cranes and other hoisting machinery. Charles Hathaway, Jr., F. J. Patterson, Wm. Russell, E. J. Leighton and Jas. Lonergan, all well known in Cleveland, are the incorporators.

The Caldwell Sash Balance Co., of Rochester, N. Y., are introducing to car builders, etc., a sash balance for car windows. They expect to do a large business with this class of trade.

The Rochester Car Wheel Works, of Rochester, N. Y., are very busy. They are running their car wheel foundry to its full capacity.

Messrs. Drake & Wiers, of Cleveland, O., have recently received some large orders for their car roof, most of them from railroad companies who have tried it and, knowing what it is, have wanted more.

Messrs. Boaz & Co., Cincinnati, O., dealers in railroad supplies, report business as excellent.

The limited trains of the Erlanger system, which run between Cincinnati and Florida, are equipped with all that tends to make travel a luxury. The coaches are elegantly furnished and supplied with all modern conveniences, including steam heat and Pintsch gas.

The equipment of 200 cars for the New York, New Haven & Hartford Railway Company, with steam heat, has been completed by the Safety Car Heating and Lighting Company, of New York. The New York & New England cars are being rapidly fitted with the Gibb's couples which are used in connection with the Safety company's hot water circulating system.

The Garvin Machine and Tool Company of this city have a very interesting exhibit at the American Institute Fair, consisting of machine tools of their own manufacture and of the several concerns for which they are the New York agents.

Mr. John Duntley entered into an engagement with the Blakeslee Manufacturing Company, of Cleveland, on Oct. 1, as Western manager, with offices 447 Rookery Building, Chicago. Mr. Duntley is one of the most popular railway supply salesmen in the West. He has just returned from a short trip to St. Louis, where his sales exceeded any his firm have made in that vicinity.

Messrs. Schleicher, Schumm & Co., of Philadelphia, agents in this country for the Otto gas engine write us: "Our German correspondents inform us that at the Strasburg Industrial Exposition, where an unusually large number of gas engines of all makes and description were exhibited, they alone were awarded for their 'Otto Gas, Gazolene and Petroleum Engines' the highest diploma and gold medal for superior design and workmanship."

Our Directory.

Atlantic & Pacific.—D. R. Gobel has been appointed general superintendent, with headquarters at Albuquerque, N. M.

Chesapeake & Ohio.—A. F. Stewart has been appointed master mechanic Cincinnati and Huntington divisions, with headquarters Huntington, W. Va., vice William Hassman.

Chicago & Ohio River.—E. O. Hopkins has been appointed general manager, with headquarters at Evansville, Ind., vice J. D. Livingston, resigned.

Columbus, Hocking Valley & Toledo.—C. H. Rockwell, general superintendent, has resigned.

Denver & Rio Grande.—E. T. Jeffery has been appointed general manager and president, with office at Denver, Col.

Elmira, Cortland & Northern.—Geo. Richards has been appointed master mechanic, vice T. Kearsley, resigned.

Florida Central & Peninsular.—M. J. Rogers, superintendent of machinery, has resigned.

Georgia & Eastern.—J. W. Riley has been appointed superintendent, vice A. H. Palmerton resigned.

Illinois Central.—Orin Ott, purchasing agent, has resigned.

Lake Shore & Michigan Southern.—A. B. Newell has been appointed superintendent of the Kalamazoo division. A. H. Smith has been appointed superintendent Lansing division, vice R. C. Harris, resigned.

Newport News & Mississippi Valley.—William Hassman has been appointed superintendent of motive power, vice J. W. Luttrell, resigned.

Ohio & Mississippi.—W. S. Martin has been appointed superintendent.

Rome, Watertown & Ogdensburg.—H. W. Hammond, superintendent of Eastern Division, has resigned.

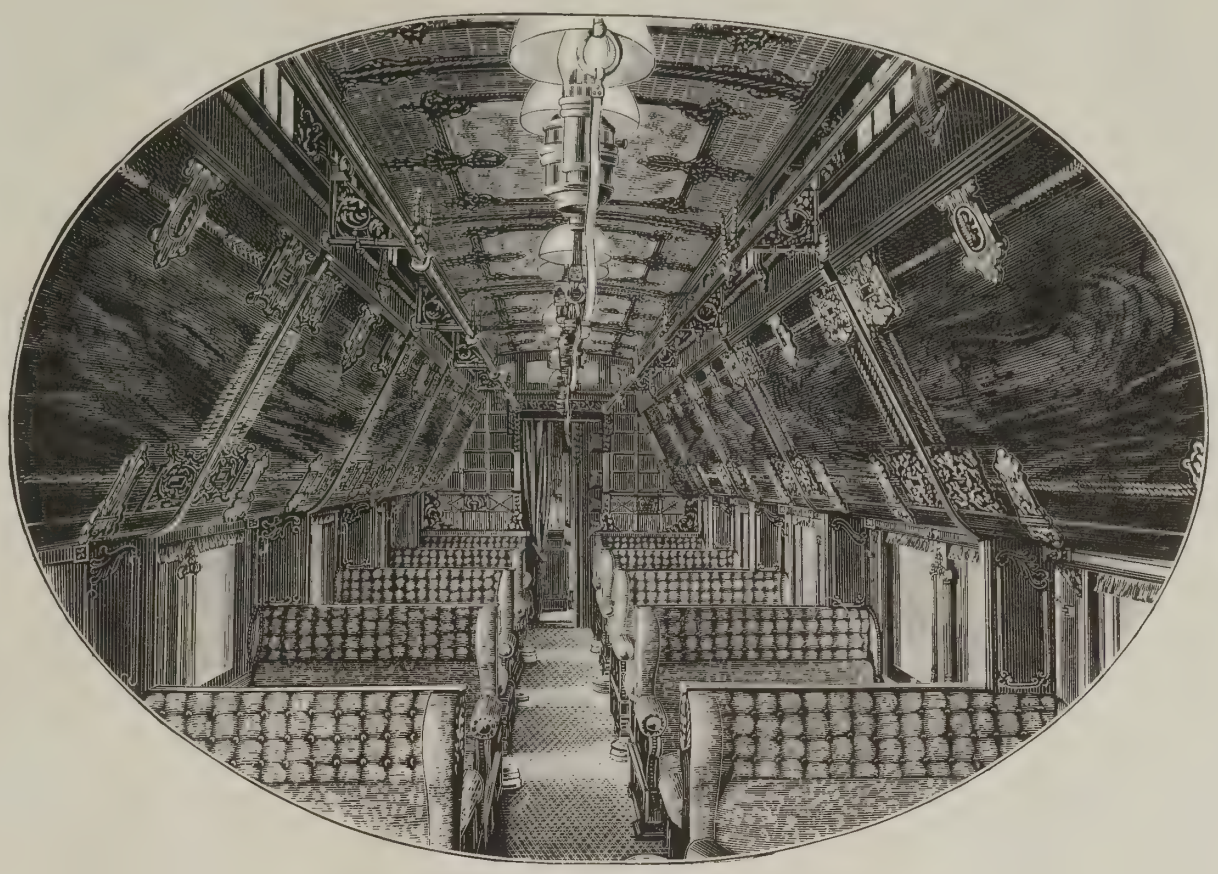
San Antonio & Arkansas Pass.—D. B. Robinson, general manager, has resigned.

St. Louis, Iron Mountain & Southern.—M. Roberts has been appointed master mechanic at Baring Cross, Ark., vice H. C. McKelvey resigned.

Texas & Pacific.—J. Patton has been appointed master mechanic of the Rio Grande division.

Wanted.

WANTED.—A brass molder of 22 years' experience, 17 years on locomotive work, desires a position. Has been 12 years in charge of foundry. Address John E. Stanton, 7321 Second street, E. E., Pittsburgh, Pa.



WAGNER'S PALACE CARS,

Built by T. A. Bissell, Buffalo, N. Y.

NATIONAL CAR AND LOCOMOTIVE BUILDER

DECEMBER, 1891.

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The South Carolina Railroad people are in the market for locomotives.

The Pennsylvania Railroad Company have broken ground at Renova, Pa., for a passenger car shop 138 × 238 feet in size.

The Mexican Central Railroad has ordered five double ended Johnstone compound locomotives for service on mountain grades.

The Rhode Island Locomotive Works are about ready to deliver to the Chicago & West Michigan six eight-wheel engines and two switches,

The Old Colony Railroad has just contracted for the building of ten passenger locomotives of their standard pattern. They will build six moguls in their own shops at South Boston.

The Hall Signal Company have received an order from the Jersey Central for eighteen signals. President Maxwell, of the Jersey Central, speaks very highly about the efficiency of the signals in use.

The London and Northwestern Railway Company have lately built at Crewe a particularly large compound passenger locomotive for service on the through trains between England and Scotland

The Queen & Crescent is in the market for 400 new cars, to be used on the Alabama Great Southern division. The contract will probably be let next week, and it is expected that the order will go to the Ohio Falls Car Company.

The Souder Railway Freight Car Company has been incorporated at Newport, Ky., by John S. May, Philip Engleskirger and E. E. Hughes, to manufacture freight cars under the patent of Jacob J. Souder, of Washington, D. C. The capital stock of the company is $2,000,000.

At the December meeting of the New England Railroad Club the subject of Tools and Machinery for Railroad Shops will be discussed. The executive committee of this club deserve commendation for the practice they have of arranging the subject for discussion one meeting ahead.

Two solid wood passenger cars are being made in Tulare County, Cal., for exhibition at Chicago in 1892. They will be made from the trunk of a *sequoia gigantea*, shaped to the outward form of cars, and then hollowing out and finishing in the interior, with its seats, etc. The whole car will be polished.

The United States Rolling Stock Company, Anniston, Ala., are enjoying a very satisfactory trade. They now have enough orders booked to keep their foundries running until the middle of February. The company expect to be able to take their business out of the hands of the receiver during the present month.

The following resolution was adopted by the New England Railroad Club at last meeting: The regular meeting of this club shall be held on the second Wednesday of each alternate month, commencing January, 1892, provided, however, that the meeting in July of each year may be omitted by vote of the club.

An exchange asked: Why do not railroad corporations take more women into their employment? Most of them know how to manage trains; they can handle switches very carefully; there is less color blindness among them than among men, and occasionally one is to be found who can "fire up" beautifully.

At a meeting of the directors of the Pennsboro & Harrisville Railroad, held in Clarksburg, W. Va., Mrs. Hattie M. Kimball, widow of the late Moses P. Kimball, was elected president of the company. She will assume the duties of the office on Jan. 1. Mrs. Kimball is said to be the first woman ever elected to such a position in the United States.

The Queen & Crescent is to put in service in the early part of December two new vestibule trains, the cars for which were built by the Barney & Smith Manufacturing Company. The two trains will be vestibuled throughout with the Barr vestibule. One train will run between Cincinnati and Jacksonville and the other between Cincinnati and New Orleans.

There is a very enterprising reporter for the Associated Press in Chicago. He has lately sent the information by wire all over the country that the style known as compound locomotives seems to attract the attention of railroad managers more than any other, and is rapidly coming into general use. Several roads are now experimenting with them and others contemplate doing so.

The American Street Railway Association has applied for 50,000 square feet in the Transportation building and appointed a committee to help Chief Smith get a suitable exhibit, which will be collective. The committee comprises men interested in street railways from New York to San Francisco and from Montreal to St. Louis. John B. Parsons is the Chicago member.

The New York State Board of Railroad Commissioners has received a joint application from the four principal street railroad companies of Brooklyn for its approval of a change of motive power from horses to the overhead single trolley system of electricity on all the routes of these companies, except those now operated by such power, or for which permission to make the change has already been granted.

The Barney & Smith Manufacturing Co., of Dayton, O., is building the following passenger cars: 30 for the Queen & Crescent route, 30 for the Chesapeake & Ohio, 25 for the Lake Shore & Michigan Southern, 25 for the Cincinnati, Hamilton & Dayton, and 19 sleeping cars, mahogany finish, for the Canadian Pacific. The Cleveland, Cincinnati, Chicago & St. Louis' order for 50 passenger cars is reported to have been awarded to this firm.

The St. Charles Car Company has completed six very handsome passenger cars for the Wabash road. They are 64 feet long, mahogany finish, with a smoking-room, and have six-wheel trucks. They are considered by car builders the most substantial cars in the West. They are for trains running between St. Louis and Toledo and Kansas City and St. Louis. A train of cars for the Centralia & Chester, consisting of a first-class car, smoker and baggage and express car. The Texas & Pacific order for 400 coal cars will go out of the shops at the rate of 15 cars a day next week.

President Yerkes recently distributed 975 in gold, says a Chicago paper, among prize gripmen of his cable lines. Three prizes are annually offered by the company, of $100 to $75 and 50 each, to gripmen with the best annual record. On examination it was found that nine gripmen had a record without an accident or a complaint, and that twelve others were entitled to either first or second prizes. The nine received $75 and the other twelve $25 each, making a total of $975 awarded, instead of $225 promised. This is a just and generous recognition of merit, capability and efficiency in work, and the showing is a creditable one both for the company and the employés.

Announcement is made that the Reorganization Committee that have had charge of the affairs of the Westinghouse Electric and Manufacturing Company, of Pittsburgh, have made an entire success of their undertaking. During the latter part of last week the firm commenced to lift all paper of the company held by the different banks in Pittsburgh. Lemuel Bannister, general manager of the company, stated that it is impossible to name the exact date when all the indebtedness of the Westinghouse Electric and Manufacturing Company will be paid off, but it will be done as rapidly as possible. It is understood that the firm have a considerable number of orders on hand for the construction of electrical machinery, and their large works in Pittsburgh are being operated full time.

The contract amounting to $2,500,000 has been closed with the Phœnix Iron Company by the Northeastern Elevated Railroad Company, of Philadelphia, for an elevated railroad five miles in length, and the rolling mills will begin work at once. The road is to be double track, and the estimated cost is $500,000 a mile. The portion first to be built will extend from Amber Street, which is 2½ miles north of Market Street, south. The road will be of lattice construction, thus darkening the street as little as possible. It will be built to sustain a live load of two coupled locomotives, weighing 50,000 pounds each, these followed by loaded passenger cars of 40,000 pounds each. Any weight under this will strain no part of the structure more than one-fifth its ultimate strength. The minimum height in the open will be 14 feet above the street.

A New York *Tribune* reporter, who has been engaged in the waste of time looking away from home for accomplished liars, has just interviewed the engineer who ran the Kansas Pacific engine through the Kiowa bridge some twelve years ago. This last liar, who completes a list of forty-two men who were running that engine, makes a great mistake when he claims that the engine was taken out of the quicksand a year after the historical dive, and was as good as new. John Bacon, the engineer who was in charge of the locomotive when it went through the Kiowa bridge and disappeared in the waterless stream, was killed, as was also his fireman and a cook who was riding on the engine. The locomotive has never been found. Col. Jack Brown, of the Denver & Rio Grande, claims to have seen it in Hong Kong last summer. The Chinese are using the boiler for laundry work.

There were few railroad men better known than Mr. Charles E. Gore, and many hearts will be saddened by the news that he died last month. Mr. Gore was born in New York State, but in early youth went West as many of our country's most enterprising young men did, and worked in various railroad shops as a machinist. The first official position he held was that of general foreman of the Louisville, New Albany & Chicago machine shops at Michigan City. From there he went to New Albany, and was master mechanic there for a time. He was afterward on the Big Four Railroad, but from the starting of the Lafayette car works until about four years ago, when he began losing his hearing, he was superintendent of the works. His loss of hearing compelled him to give up his position. About two years ago he became entirely deaf, but never lost the faculty of speech, being able to converse almost up to the very moment of his death.

At the annual meeting of the stockholders of the Pullman Palace Car Company they authorized the issue of 50,000 shares of additional stock, increasing the capital stock 20 per cent. The additional stock is to be offered at par and stockholders will have the option until Nov. 17 to subscribe to an extent not exceeding one-fifth of their holdings of record on Nov. 2. The old board of directors and officers were re-elected. The usual quarterly dividend of 2 per cent. was declared, payable Nov. 16. The statement of the company for the fiscal year ending July 31 showed gross revenue $9,772,324; disbursements, $6,783,101; surplus, $2,988,223. Total assets of the company are $45,654,670; total liabilities, 26,261,370. The output of the manufacturing department during the year amounted to $11,906,078; increase, $2,890,544. The total number of persons in the employ of the company is 13,885, and the wages paid during the year amounted to $7,303,108.

There is a way which I have not heard mentioned by which an engineer can test the length of the train pipe while running on the road, without making an application of the brakes at all, and by which he can tell within two cars. If the engineer's valve handle stands in the proper position, one gauge pointer will show 20 pounds excess pressure. Now, by pushing the handle to the release position and watching how far the red pointer falls, you can tell very nearly how many cars there are in the train. We find that when there are fifteen cars in the train it will go down almost exactly a pound to a car; the longer the train the less per car. Suppose a man is running on a dark night and has a meeting point or a crossing to make; he may have a suspicion that all the brakes are not set in. He can tell very easily by slipping the handle around and watching the red pointer as I say. I have often done this and guessed the number of cars, and then gone back and counted them, and I never missed by more than four cars, even on trains of fifteen or sixteen cars.—*Paul Lynnestveldt.*

Mr. George H. Daniels, the general passenger agent of the New York Central, has published a very handsome folder containing particulars of the fast special run from New York to Buffalo on Sept. 14, when the distance of 436½ miles was covered in 439½ minutes, including three stops, one of them for the cooling down of a hot box. The record is given as it was taken jointly by Arthur G. Leonard, secretary to Vice-President Webb, and by Angus Sinclair, editor of this paper. It also contains comments of the American and foreign press on this unparalleled achievement in train running. Pictures of the locomotives are given, and a variety of views along the route between New York and Buffalo. A highly interesting part of the pamphlet is a history of other great train runs. This includes the Scotch Express, the Royal Blue Limited, the New York and Chicago Limited, Baron Von Schroder and party, Mr. Herman Oelrichs and party, China and Japan Mail, Mr. John W. Mackay and party and r. James L. Flood and party. The folder will be a valuable reference to many people.

Arbitration Committee's Decisions.

The Arbitration Committee of the Master Car Builders' Association met in Chicago Oct. 16, and considered disputes referred under the Rules of Interchange of Cars. There were present: F. D. Casanane, G. W. Rhodes, M. M. Martin, and John Mackenzie. J. W. Marden, who could not attend, subsequently concurred in the decisions rendered.

A car belonging to the Illinois Central was destroyed by fire on the Chicago, Burlington & Quincy. The car was of a special design, built to carry furniture, and was 40 feet long. The owners of the car claimed higher compensation for the car than that allowed by the rules of interchange. and the C., B. & Q. refused to pay more than the legal rate. On the case coming before the Arbitration Committee, it was decided that the position taken by the C., B. & Q. people was right. They are not responsible for the cost of cars above the highest figure laid down in the rules for a 34-foot car.

The second case brought before the hearing establishes a precedent that may be of value to many roads in future. The Hannibal & St. Joseph received a Chicago, Burlington & Quincy car with a wrong drawbar on card from the Gulf, Colorado & Santa Fe. As the Hannibal & St. Joseph is a leased line of the Chicago, Burlington & Quincy it is a regular practice to repair the latter company's cars when they come upon the Hannibal line, and the car with the mixed drawbar was fixed up and bill sent to the owners of the car for the cost of a new drawbar. This bill the Gulf, Colorado & Santa Fe refused to pay on the ground that the Hannibal & St. Joseph were not the owners of the car, and that the owners alone had the right to remove the wrong drawbar and charge for the work done. The Hannibal & St. Joseph claimed that they had the same right as the owner in this case.

The Arbitration Committee decided that the Hannibal & St. Joseph had no right to repair that car and charge for the same than any other road whose initials were not on the car. The decision therefore was that the Gulf, Colorado & Santa Fe were not entitled to pay the bill sent in by the Hannibal & St. Joseph for repairing the car.

The third case heard illustrates the necessity that existed for the air brake apparatus being recognized in the rules of interchange of cars. It also provides an example of the common practice of roads interpreting the rules of interchange to suit their own notions in a way that is contrary to the letter and spirit of the rules. The Minneapolis & St. Louis received from the Missouri Pacific a refrigerator car with the pressure retaining valve missing and asked that the car be carded. The card was refused on the ground that the Missouri Pacific was not in the habit of giving cards for airbrake apparatus excepting hose and couplings.

The Arbitration Committee decided that retaining values were not excepted in the rule that says that a car must be delivered in as good condition as when received and that consequently the Missouri Pacific were responsible for the missing valve. It is one of the curiosities of the disputes in car interchange that this case should have been appealed to the Arbitration Committee with the plain rule bearing on the case.

A stock car belonging to the Pittsburgh, Fort Wayne & Chicago was delivered by the Mobile & Ohio to the National Stock Yards Company, St. Louis, which must be regarded under the rules of interchange as private tracks. Three weeks after the car was put in the tracks referred to, the owners of the car received information that the car was held in a damaged condition, one Janney coupler being cracked and two knuckles broken. A great deal of switching is done by different railroad companies in the yards where the car was and it evidently had received very rough usage after delivery. The placing of the responsibility for the damage was a very difficult question and a member of the arbitration committee went to East St. Louis purposely to investigate the case. The National Stock Yards Company has numerous tracks leading to packing houses, etc., and these are not reached by the Mobile & Ohio except by trackage rights.

The National Stock Yards Company owns and uses one engine for its own convenience in cleaning up the yards, switching hay and ice, etc., from one packing house to another. The roads reaching the yards over their own tracks, or by trackage rights, do their own work at the yards proper and at the manufacturing establishments, in consequence of which there may be as many switching engines and crews working there as there are roads. The practical result of this is that each crew has to wait its turn to do its work, which in the case of the work at the manufacturing establishments frequently involves the rehandling of cars just previously handled by another crew. On live stock handled at the yard no trackage charge is paid to the National Stock Yards Company for the use of its track, but for all dead freight handled over its tracks that company receives $1 per car for such use of its tracks. The National Stock Yards Company has never assumed or admitted any responsibility for damage to, or destruction of, cars on the tracks situated on its property. It does not inspect or receive cars from the different railroad companies, and there is no inspection of cars as between railroad companies and the National Stock Yards Company. It is customary for the road which delivers a car at the stock yards to take it out again, but there is no set rule formulated governing the matter, and as so many roads have access to all the tracks it is possible for a road to take out cars which it did not set in, or to leave cars there that it did set in.

The decision was that the the St. Louis National Stock Yards must be regarded as private tracks and the rules applicable to cars delivered to private tracks followed in settling the dispute as to who is responsible. Rule 28 holds the railroad company delivering cars to a private track responsible for any damage that may happen to such cars. The understanding is that railroad companies in the habit of delivering cars to private tracks will have some arrangement with the owners of the tracks to pay for any damage that may be incurred by cars while there. Under this rule the Mobile & Ohio Company was required to pay for the damage done to their car. It was no doubt an injustice done to the railroad company, but it was the only decision that could be rendered.

Next case is one that has been discussed frequently, viz., the right to estimate the age of a car from the time it has been rebuilt. A car belonging to the Atlantic & Pacific was destroyed on the line of the Cleveland, Cincinnati, Chicago & St. Louis, and the owner in making a bill for damages reckoned depreciation from the date when the car was rebuilt in 1889. The company responsible for the loss sustained held that it was an old car, and that the depreciation should be reckoned from the time it was first built, which was in 1881. The owners took the ground that the car was practically made a new one in 1889, having received new posts, braces, belt rail, flooring, siding, roofing, lining, grain doors, brakes and draught timbers and trucks.

The Arbitration Committee, in making the decision, adhered to the rules of interchange which plainly require that the time of depreciation shall count during the entire life of the car. This is a case where a railroad company must endure an isolated injustice that a simple rule for making decisions on may be maintained. If the time since a car was last repaired was to cover the period of depreciation there would be nothing but comparatively new cars to pay for. Some roads would claim that a car was made practically new when it got new draught timbers.

Case 94, which comes next, gives an object lesson against putting on a defect card if you don't want to pay for the repairs called for. The Lake Shore & Michigan Southern repaired a car that had a card from the Des Moines & Northern and rendered bill against the company for the repairs done. The company that did the carding considered for some reason that the Chicago, Rock Island & Pacific was responsible for the defect, and obtained a defect card from this company and sent it to the parties who had done the repairs, recommending them to look to the Chicago, Rock Island & Pacific for payment. The Lake Shore people insisted that the road applying the original card should pay for the repairs, and the case was submitted to the Arbitration Committee.

The decision of course was that the party applying the card should pay for the repairs. The question between the Des Moines & Northern and the Rock Island as to responsibility for the defect had no bearing with the road that did the repairs. This was a side issue, and the Des Moines & Northern was clearly responsible for payment of the bill for which the defect card became a voucher.

A decision on a question of old defects was rendered in a case appealed by the Minneapolis & St. Louis. That company received a car from the Minneapolis, St. Paul & Sault Ste. Marie that went on its way over the earth and did not return for a year. When it came back it was not in the bright and robust condition that characterized its departure. The owners of the car maintained that it went away strong and firm in every joint, that every bar, beam and wheel was in perfect order, and that it came back a wreck. There were sundry defect cards on the car, but there were two draught timbers split, two deadwoods damaged, two end posts broken and end sheeting broken for which no defect card was considered necessary by the delivering road, as they were old. The receiving road took a different view of the matter, and demanded cards for these defects, because they were palpably not due to ordinary wear and tear.

The Arbitration Committee decided that the Minneapolis & St Louis was required to card a car for the defects mentioned. If the damage was old the card should have been demanded from the connecting road and by the process of pushing the demand for cards backward the road doing damage would have been reached.

A dispute that arose between the Missouri Pacific and the San Antonio & Aransas Pass is well worthy of note, as the decision on it is likely to establish a precedent. A car belonging to the Missouri Pacific was destroyed on the line of the San Antonio & Aransas Pass, but the trucks were saved. These were returned to the owners over the St. Louis & Iron Mountain road, which is a leased line of the Missouri Pacific. The former road made the ordinary freight charges on the trucks, which the San Antonia people refused to pay, on the ground that the Iron Mountain road was part of the Missouri Pacific.

On the question coming before the Arbitration Committee it was decided that the road destroying the car was entitled to pay for the return of the trucks to the nearest point on the owner's road, and that a leased line with a different name is not the road to which a car belongs. The claim for the payment of freight charges was sustained.

Arbitration case No. 97 brings up an important question, and the decision rendered will be a surprise to those who thought that the rules of interchange were established to prevent disputes. The Lake Shore & Michigan Southern delivered to the Chicago, Milwaukee & St. Paul a car having a standard M. C. B. axle in place of the standard of the road, which is ¾ inch longer. The owners claimed a defect card, because a wrong axle was used, and alleged that the axle could not be run safely under the car owing to liability to run hot and to cutting at the back fillet of the journal. The Lake Shore people held that they had followed the rules of interchange of cars in repairing with the M. C. B. standard size of axle, and that the difference in length was not sufficient to impair the efficiency or strength of the car; that it fitted the car; that it allowed sufficient play to the journal bearing; that it brought the center of the bearing only ⅛ inch beyond the center of the journal; and that they had accepted and run cars of similar construction with axles similar to that which was objected to in this case without experiencing any trouble from hot boxes.

The Arbitration Committee sustained the objections raised by the owners of the car against the change of axle, and held that the substituting of an axle ¾ inch longer than the original was contrary to the spirit of the rules of interchange. It seems to us that this decision intimates that all the discussion about using M. C. B. standard parts in repairs was useless waste of words. It also intimates that the rule making it proper to use M. C. B. standards in repairs as substitutes for parts that are not standard is a dead letter. After this decision any road will be at liberty to demand a card for a car having M. C. B. standards used in repairs.

Arbitration case No. 98 illustrates the danger of accepting a car having an irregular defect card upon it, which cannot be used as a voucher when repairs are done. A car belonging to the American Refrigerator Company had been damaged on the Chicago, Milwaukee & St. Paul road, but it was in a safe condition to run and a private card was applied calling for the car to be returned when empty to Chicago without repairing the defects mentioned. The car was returned to the owners when empty and not to the C., M. & St. Paul Railroad. The repairs were made by the owners and a claim made upon the C., M. & St. Paul for the cost of repairs, which was contested on the ground that the work was not done on a regular M. C. B. defect card.

On the case going to the Arbitration Committee the decision exonerated the C., M. & St. Paul from paying the charge on the ground that only the regular M. C. B. defect card can be used as a voucher in claiming payment for repairs made. The case is quite a curiosity. A road violates a plain principle of the interchange rules, and uses an irregular defect card which ought to be refused by other roads. Then when the car has passed along under this wrong card till it reaches the owner, the road responsible for the damage refuses to pay the cost on the ground that its own card is irregular. The whole thing is a disgrace to the men responsible for the sharp practice displayed.

The Chicago & Northwestern has a piece of track in Chicago adjoining a rail mill. Some cars were delivered to this track by the Chicago, Milwaukee & St. Paul on switching charges. The brasses were stolen from a number of cars while standing in this track. The Chicago & Northwestern keeps no inspector at the place, but the loss of the brasses was discovered by the Chicago, Milwaukee & St. Paul inspector when the switching engine belonging to the former road was pulling the cars out. He tried to stop the cars, but the switching crew hauled the cars away to a distant track, and several of the journals were damaged by running without brasses so that the wheels had to be changed.

The Arbitration Committee held the Chicago & Northwestern responsible for the brasses stolen and for the damage done to the journals.

The Atchison, Topeka & Santa Fé operates a most diverse collection of locomotives that must keep the cost of repairs abnormally high. The road traverses a region noted for bad feed water that causes great expense for boiler repairs. Wages are unusually high in that Western country and fuel is dear. With all these disadvantages to contend with we find that for the month of September the locomotives belonging to the road were operated at a total expense of 20.26 cents per mile run. Good management that.

Commercial Refrigeration.

The Hon. David A. Wells, in his valuable work on "Recent Economic Changes," says that "the world has never seen anything comparable to the results of the recent system of transportation by land and water; never experienced in so short a time such an expansion of all that pertains to what is called business; never attained to such control over the forces of nature, and so compassed their use to reduce the effort to insure a comfortable subsistence in a far greater measure, than in the past 25 to 30 years. A volume might be written showing the multiplicity of inventions and experiences which have contributed to this result; but, perhaps, the perfection of the marine engine and of the discovery of Bessemer steel have been more potent than any other two specific causes. Certainly, when one comes to study the science of refrigeration as a factor in modern subsistence, he must conclude that it is not a violent assertion to make that its importance to-day is directly traceable to the influence of those two elements, which have united to give the world cheap transportation, thus making possible the distribution of those products of nature and applied science that may be utilized on a commercial scale only by means of refrigeration, whether that be accomplished by natural ice or by mechanical means; for the history of the science runs back only to the time (less than 15 years ago) when those two factors in transportation had attained to, comparatively, the high efficiency of to-day.

It is true that the use of ice and snow for cooling water, wines and liquid foods is very old. In ancient Asia and Italy, as in Mexico to-day, snow was gathered in sacks on the mountains and stored in underground cisterns for daily use, and the quarrying of ice in caves, as at Mt. Etna, was long a familiar practice, yet so slowly and so little was the antiseptic power of ice recognized and appreciated that 100 years ago ice was an almost unknown article of commerce. To international commerce it was entirely unknown until Frederick Tudor, in 1805, began shipping it from Boston to the West Indies. His first venture was a pecuniary failure, but Tudor was a pioneer with unbounded faith, and eventually succeeded, and in 1836 was known as the "Ice King" of the world. He was the first man who sold ice in the South—at Charleston in 1817; in New Orleans in 1820. In 1832 he opened a trade with Calcutta, and in 1834 with Rio Janeiro, Brazil, yet for many years after Tudor's ice ships had circumnavigated the globe, teaching the world the use and benefits of ice, more ice was used in the hot South than at the North, where the wells cooled the water and the wines—the only real use to which ice was then put.

It must be remembered that forty years ago the sciences were little more than a crude mass of ill-digested or "unassorted" laws, and that in the departments of physics and chemistry comparatively little had been accomplished in the way of industrial application or direction. One need not be very old to remember the first refrigerators seen in hotels, markets or private houses. Milk and meat had, indeed, been preserved temporarily in small ice houses in the country until they could be hurried to market; so that when the refrigerator did appear, crude as it was, its value in utilizing the antiseptic property of ice was at once recognized, and it came rapidly into universal use, and on a constantly augmenting scale—reaching from the family refrigerator to cold storage house, cooled by hundreds of tons of ice. The science of refrigeration, however, as in practice to-day in its highest perfection, begins with the introduction of the ice machine and the perfection of methods to produce cold by mechanical means, coupled with our system of cheap and rapid transportation. The patents of Prof. Twinning, of New Haven (U. S., 1853), cover, under certain modifications, all the practical ice machines since operated; yet so timid is capital that it was fully thirty years later before Twinning's and other inventors' ideas were put into practice for the creation of a permanent industry of ice-making. But even before this time, the brewers had begun to utilize these inventions by substituting the cold produced mechanically by the ice machine for ice, in cooling the hot beer wort and for preserving beer, by placing in the vat or in the fermenting room and stock house the brine or direct expansion coils of the ice machine, by which the temperature was lowered to and held at the degree desired. From the brewery, the use of this principle and the machinery extended rapidly to the beef and pork packing-houses, cold storage establishments, the holds of ships and other places where a low temperature is needed for the preservation of fresh meat, fish, eggs, butter, fruits and other food products; and it has been found in practice that by this application of mechanics a dry, cold air may be obtained, without the use of ice, for the preservation, on a commercial basis, of perishable goods for an indefinite length of time and on the most extensive scale.

We have now reached the last stage—the distribution. It having been shown that, by either ice or cold mechanically produced, perishable food products can be preserved in their native or original quality for an indefinite period, and the improved steam engine and cheap rails having marvelously cheapened transportation, there remained only the perfection of the refrigerator car (tentatively introduced as early as 1867) to insure these products a world-wide distribution, under conditions of temperature similar to those surrounding them in storage. The history of this great invention and its unmeasurable influence on the world's subsistence is so recent that it need not be repeated here. It is sufficient, perhaps, to say, that refrigeration, supplemented and consummated by the refrigerator car and the steampship, has opened up new lines of commerce between nations, and developed the greater resources of sections of our own country, without which their characteristic products would be practically worthless—as the fruit regions of the tropics and of our own South and Pacific coast, and the grazing lands of the antipodes—and made possible the marketing of many valuable food products of every clime that otherwise would be valueless outside their immediate place of production. It has also rendered possible the establishment of great industries for food production and distribution, which have added enormously to the wealth of both the city and country, and, in connection with cold storage, has given the great mass of the people a greater variety of wholesome foods and for a longer period of the year than a generation ago would have been dreamed of as possible or probable; for the meats, fish and vegetables, that in older times had to be consumed soon after they were prodnced, are now preserved for long periods and transported long distances to consumers, who, but for these modern appliances, could never taste many of the luxuries of our every-day life, not to mention many foods that are to-day deemed actual necessities.

Among the most prominent of the promoters of transportation by refrigerator cars to-day is the Southern & Pacific Refrigerator Car Co., of Chicago, the experience, energy and intelligence of whose officers, coupled with the excellence of the principles of refrigeration in their cars, have practically overcome the difficnlties arising from the variations in climatic conditions, and solved the problem of the transportation of perishable goods, thereby enabling them to place the products of the great West in all their pristine freshness, within as easy reach of the markets of the East as if grown and produced at its very doors.

The First Pennsylvania Train.

On November 12 a meeting of railroad and state dignitaries was held at Bordentown, N. J., to celebrate the 60th anniversary of the first movement of a train on the Camden & Amboy Railroad, the first railroad in New Jersey and the oldest portion of railroad now operated by the Pennsylvania Railroad Company. The historic spot where the "John Bull" started is marked with a granite shaft built of the blocks upon which the rails were laid. The locomotive "John Bull" was brought from England early in 1831 and was set up by Mr. Isaac Dripps, then a young man, now alive in his 82d year. Mr. Dripps afterward became the first superintendent of motive power for the Camden & Amboy Railroad and was the first man to have that title. He acted as engineer of the John Bull during the first trial of the engine. The engine pulled two cars built by M. P. & M. E. Green, a firm of carriage makers in Hoboken, N. J., which constituted the first train. The cars were built on the English model with seats arranged as in the old stage coach, which was the ideal of comfortable passenger transit in the days preceding railroad building. As most of our readers know this historical locomotive, the John Bull, now holds an honored position in the Smithsonian Institute at Washington.

Good and Bad Emery Wheels.

The emery wheel is becoming one of the most important and economical tools in a railroad shop, yet there continues to be dense ignorance among users of the qualities that go to make up an emery wheel, combining the important elements of a rapid cutter and a durable article. Where care and knowledge are employed in the selection of emery wheels a first-class article is certain to be procured. When an emery wheel is bought merely because it is the cheapest to be found in a dealer's, it is almost certain to prove an inferior article, and no kind of inferior tool is so comparatively worthless as an emery wheel.

Considerable valuable information concerning emery wheels has recently been furnished by a report on the subject by a committee of mechanical engineers, of which Dr. Coleman Sellers was a member. Very exhaustive tests of emery wheels were made at the Stevens Institute of Technology, Hoboken, N. J. Having determined on the qualities which constitute a good emery wheel, the committee established their own conditions of test, and selected wheels from 15 different manufacturers. No hand testing was followed. All the work done was capable of exact measurement. The grinding was done on cast iron bars, special care being taken to secure bars of uniform size and quality. The trials were made at different pressures and numbered several thousands. The pressures were 42, 60 and 100 pouuds. From the time each test began exact records were made as to speed, power, resistance between wheel and metal, amount of metal ground off, amount of wheel material worn away, and notes as to cleanness of cut, amount of heat generated, amount of glazing or clogging up of wheel with metal, and as to cracks, breaks and defects of the wheels. Of the 15 varieties tried, six were found too unsafe to warrant their general use, 57 per cent. of the whole wheels bursting under conditions which other wheels passed through uninjured. Eleven varieties were found to be such slow cutters that the average metal removed by 10 of them was less than the general average of all the wheels. Only three safe, effective and satisfactory wheels were found among the 15 selected. The Tanite was one of the wheels that went through the test satisfactorily.

The performance of these emery wheels, no doubt, represents fairly the worth of the ordinary wheels to be found in the market. That is to say 40 per cent. of the makers offer for sale wheels that are not safe for the work that they may be called upon to perform and only 20 per cent. of the wheels are really good. It appears to be high time that the people who buy these wheels and use them were doing something to demonstrate what wheels ought to be rejected.

The Old Times and the New.

A train of 225 loaded four-wheel coal cars passed over the Lehigh Valley Railroad a few days ago. It was the longest and heaviest train ever carried over any road in this country, and that means in the world. Naturally this train suggests a comparison with the trains of Conestoga teams which 60 years ago toiled between eastern Pennsylvania and Pittsburgh. The teamster of that period never, in his wildest conception, imagined such an event as the one related above. Had anyone prophesied that before the century was out trains of cars containing 2,000 and more tons would traverse in a single day a distance as great as that between Philadelphia and Pittsburgh, he would have set down the prophet as the wildest of visionaries. Few greater wonders have been brought about in the nineteenth century than this marvel of rapid transportation. It has cheapened the cost of living, been productive of good in a hundred directions, and made the whole world neighbors.

An Electric Crane That Will Pick Up a Locomotive.

Before the Baldwin Locomotive Works had electric cranes in the erecting shop, it was an all-night job for a gang of men to get a finished locomotive out of the shop and on the tracks ready for shipment. Now it can be done with a fraction of the trouble and labor in about five minutes. The crane consists of a pair of heavy iron girders placed side by side and extending clear across the shop. The hoisting drums are placed upon the girder bridge, and as the bridge itself travels along the entire length of the shop upon heavy rails, a load can be picked up and carried wherever it may be desired to place it. Power for the hoists is furnished by two 40-horse-power electric motors, and there are two sets of hoisting apparatus on the traveling bridge, each with a capacity of lifting 50 tons. In lifting a locomotive a rope is placed under the front end of the engine, and a heavy iron frame is placed under the rear end. Massive chains connect with the hoisting gear, and when the motors are started the engine raises slowly but irresistibly. The rail upon which this crane travels along the shop weighs 135 pounds to the yard, and is the heaviest rail ever rolled. It is of the same pattern as an ordinary railroad rail, and was rolled especially for these works.—*Philadelphia Record.*

Scarcity of Cars.

A recent dispatch from Kansas City says: The car famine is getting to be a more serious matter daily, not only here, but over all the West. J. T. Templar, the big Santa Fe grain shipper, was in town on his way home from Chicago. He says his elevators in Kansas, numbering about 100, are full of grain, which cannot be moved on account of the scarcity of cars. He has been forced to stop buying grain at some stations on this account. Mr. Templar says it is not a question of how much grain there is in Kansas to be moved. The question is how much can the railroads carry. He thinks every car which can be supplied can be used from now until next July. The Santa Fe Company moved its freight cars on an average 35 miles a day last month. General Manager Robinson says this average has never been surpassed and probably never will be. The movement of every staple commodity—oats, corn, cattle and cotton—is unpredecented. For the wheat crop alone there will be required 50,000 cars more than were ever used before in a year's wheat movement. The local supply of cars decreases daily. The shortage on the Missouri Pacific to-day amounted to between 550 and 600 cars. The Memphis has been able to furnish a few cars, but still needs 1,000. The Wabash has been refusing freight, and is short of cars despite the statements to the contrary. The Maple Leaf business is increasing, and the supply of cars on that road is growing less.

The robbing of cars belonging to the West Shore Railroad by a gang of thieves in New York has led to the belief among the officers of the company that the men doing the stealing were in possession of sealing irons. If the people concerned will investigate the seal question properly they are likely to find that the wretched seals used on many cars can be readily broken and fastened again to look as good as new. There is no small detail about freight cars that is more in want of improvement than the common seal.

Leverage of Bell Cranks.

For the purpose of determining the leverage of bell cranks as applied to the raising of throttle valves, two were used in the experiments.

One was taken from Engine 475 and had lever arms of 4".5 and 6" respectively. The other had lever arms of 4".5 and 11", being the dimensions of bell crank used in Engine 525 and class.

As the bell crank of Engine 525 was something less than 90°, I had one made with the 90° angle and the same length of arms.

The bell crank of Engine 475 was made 90°.

The figures, numbered from 1 to 4 inclusive, show the method of operation. In each case a known weight was placed at *a*, and enough weight placed at *b* to just balance it.

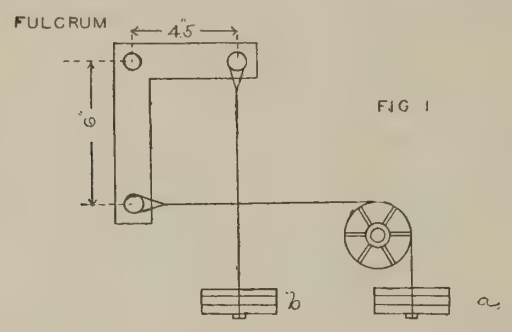


FIG 1

Weight at *a*.	Weight at *b*.	Weight at *b* by calculation.	Difference.
10.0 lbs.	12.9 lbs.	13.3 lbs.	0.4 lbs.
20.0 "	26.0 "	26.6 "	0.6 "
40.0 "	52.4 "	53.2 "	0.8 "
80.0 "	105.4 "	106.4 "	1.0 "
120.0 "	158.4 "	159.6 "	1.2 "
160.0 "	211.4 "	212.8 "	1.4 "
240.0 "	317.6 "	319.2 "	1.6 "
320.0 "	423.8 "	425.6 "	1.8 "
400.0 "	530.0 "	532.0 "	2.0 "

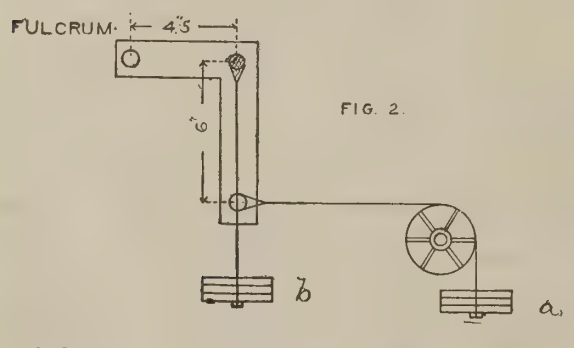


FIG. 2.

Wt. at *a*.	Wt. at *b*.	Wt. at *b* by ordinary calculation.	Wt. at *b* by angular calculation.	Diff. between actual wt. at *b* and ordinary calculation.	Diff. between actual wt. at *b* and angular calculation.
10.0 lbs.	12.7 lbs.	16.0 lbs.	13.2 lbs.	3.3 lbs.	0.5 lbs.
20.0 "	26 1 "	32.0 "	26.6 "	5.9 "	0.5 "
40.0 "	51.3 "	64.0 "	53.3 "	12.7 "	2.0 "
80.0 "	103.7 "	128.0 "	106.7 "	24.3 "	3.0 "
120.0 "	157.1 "	192.0 "	160.1 "	34.9 "	3.0 "
160.0 "	209.4 "	256.0 "	213.4 "	46.6 "	4.0 "
240.0 "	315.7 "	384.0 "	320.2 "	68.3 "	4.5 "
320.0 "	421.9 "	512.0 "	426.9 "	90.1 "	5.0 "

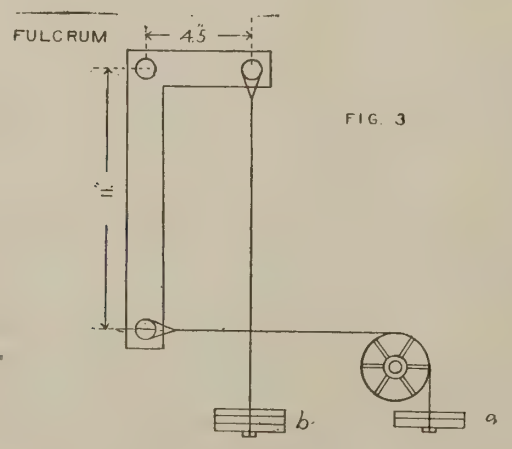


FIG. 3

Weight at *a*.	Weight at *b*.	Weight at *b* by calculation.	Difference.
10.0 lbs.	24.1 lbs.	24.4 lbs.	0.3 lbs.
20.0 "	48.0 "	48.8 "	0.8 "
40.0 "	96 8 "	97.6 "	0.8 "
80.0 "	194.2 "	195.2 "	1.0 "
120.0 "	291.6 "	292.8 "	1.2 "
160.0 "	389.0 "	390.4 "	1.4 "

Figures 5 and 6 show the method of ascertaining that component of the weight applied at *a* which tends to lift the weight at *b*.

When the bell cranks are supported as shown by figures 1 and 3, the weights are inversely proportional to the length of the arms.

By the ordinary method of calculation, I take the weight at *a* and multiply by the shortest distance from the fulcrum to the point of application; but as the weight is not applied at right angles to the line joining these two points, there is a certain loss of power depending upon this angle of application.

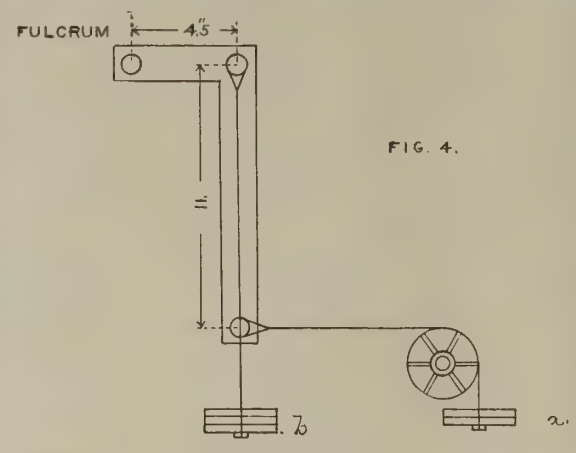


FIG. 4.

Wt. at *a*.	Wt. at *b*.	Wt. at *b* by ordinary calculation.	Wt. at *b* by angular calculation.	Diff. between actual wt. at *b* and ordinary calculation.	Diff. between actual wt. at *b* and angular calculation.
10.0 lbs.	24.7 lbs.	26.4 lbs.	24.5 lbs.	1.7 lbs.	0.2 lbs.
20.0 "	49.2 "	52.8 "	48.9 "	3.6 "	0.3 "
40.0 "	98.4 "	105.5 "	97.9 "	7.1 "	0.5 "
80.0 "	196.8 "	211.0 "	195.8 "	14.2 "	1.0 "
120.0 "	295.7 "	316.5 "	293.7 "	20.8 "	2.0 "
160.0 "	394.0 "	422.2 "	391.6 "	28.2 "	2.4 "

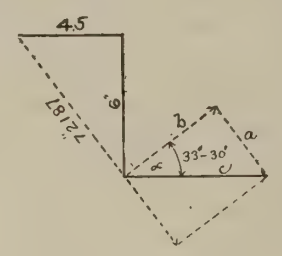


FIG. 5.

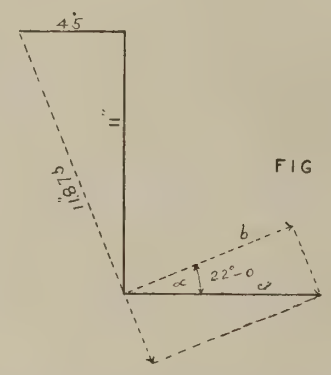


FIG 6.

In the angular calculation I have resolved the weight at *a* into two components by a common trigonometric equation, and used only that component of the force which acts at right angles to the line connecting the fulcrum with the point of application.

The actual weights at *b*, as will be seen, conform very nearly to those obtained by the angular calculation, which shows that the angularity just about offsets the advantage of the longer lever arm.

GEO. W. FARMER,
In charge of Testing Department A., T. & S. F. Ry.

Facts About Timber.

Through the kindness of Mr. B. Frenow, chief of the Forestry division of the Department of Agriculture, Washington, we have received particulars respecting tests of timber beiag conducted by the United States Government which supply valuable information for all persons interested in structures where wood is employed. Those who are accustomed to seeking information about the strength of different kinds of timber find plenty of particulars in engineering text books, but actual tests made within the last few years by various individuals and investigators have demonstrated that the rules in the text-books are little better than guesses, and that some of them are far wide of the truth. It has then become a highly important matter to find accurate facts regarding timber, and this is what the Department of Agriculture is now doing. The investigation aims to obtain the means of determining the quality of timber by the examination of physical appearance and structure, and of establishing an inter-relation between quality and the condition of growth.

Some of the questions to be investigated are: What are the essential working properties in our various woods and by what circumstances are they influenced? What influence does seasoning of different degrees have upon quality? How does age, rapidity of growth, time of felling, and aftertreatment change quality in different timbers? In what relation does structure stand to quality? How far is weight a criterion of strength? What microscopic aids can be devised for determining quality from physical examination? What difference is there in wood of different parts of the tree? How far do climate and soil conditions influence quality? In what respect does tapping for turpentine affect quality of pine timber?

It is also proposed to test, as opportunity is afforded, the influence of continued service upon the strength of structural material, as for instance of members in bridge construction of known length of service. This series of tests will give more definite information for the use of inspectors of structures.

A great many specimens of timber for testing have been procured from all parts of this continent, and numerous tests that are of special interest to car builders and other railroad men have been made under the supervision of Prof. J. B. Johnson at Washington University, St. Louis, Mo. Some specimens of white pine from Wisconsin were tested for tensile strength, and they varied from 6,600 to 12,400 pounds per square inch. Specimens of long leaf yellow pine from Alabama were tested, and they varied from 18,900 to 29,500 pounds per square inch. The highest figures are extraordinary, and show this kind of timber to have a greater tensile strength than ordinary cast iron.

In the cross bending tests it was found that the strength of timber varies greatly with the amount of moisture in it the dryer the stick the stronger it is to resist weight. When a beam is too short, with reference to its depth, it does not break across but shears or splits lengthwise along the center, and so becomes two beams instead of one. It is then only half as strong as it would be if it acted as one beam, and then each part breaks as a single beam under half the load it would require to break the beam as a whole if it had not split. For this reason wind shakes or season checks along or near the center of a beam become great sources of weakness, even to the extent of destroying half the original strength of the stick. The effect of knots is to greatly weaken a beam, even when near the middle, whether they are on the upper or lower side.

The work on hand has not progressed far enough to demonstrate the course of the difference in the strength of wood of the same superficial quality, but that will no doubt be discovered and elucidated as the investigations proceed. The intention is to do the work in such a systematic and thorough manner that the data established will become standard all over the world. The strength and value of a given species or stick will then no longer be a matter of opinion, but a question of established fact. We expect to keep our readers fully informed on the progress of this very important undertaking.

Fuel for Railroad Use.

At the last meeting of the Northwestern Railroad Club Mr. P. H. Conradson, of the Great Northern, presented a paper on the economy of coal. He dwelt at considerable length on the quantity of sulphur present in coal and the effect produced by its combustion. He directed attention to the fact that the quantity of sulphur present in coal varies from a trace to five per cent. When it passes off without touching moisture, the sulphurous acid produced by the combustion of sulphur will do little harm, but when it comes in contact with the water of leaky flues or damp plates, the sulphurous acid takes up more oxygen and becomes sulphuric acid, which corrodes everything touched. The lesson of this would be, prevent leaks when sulphury coal is burned.

Specimens of different kinds of coal were shown coked in an experimental retort which produced coke of decidedly different character. A similar effect would be produced in burning these different kinds of coal in fireboxes. To get the best results from the coal it would be better to burn each kind in fireboxes with draft appliances regulated to suit.

The paper summed up as follows: The economical use of coal in locomotives should not begin with the fireman, but at the mine. By proper selection of coal, by a rigid inspection at the coal docks, by a systematic chemical examination of the coal, by a practical burning test of the coal in a suitably designed apparatus large enough to give practical comparative results, by distribution of the different coals in such a way that the same kind of coal as near as practically possible will always be sent to the same point of the road, and by a complete knowledge of the boiler water in use—by closely following these points we will attain economical methods.

When we know and control all these points to our best knowledge then can the manager expect to look at his master mechanic and superintendents for comparative economy in fuel; and after that it is time for the master mechanic to look after his firemen and see that they do their duty.

Coupler Gauges.

Secretary Cloud has sent out the following circular for the Master Car Builders Association:

The Pratt & Whitney Company have advised that orders had been received for only 12 sets of coupler gauges up to Oct. 17, six of which are for railroad companies and six for coupler companies; and inasmuch as the preparation of the tools and fixtures required to make these gauges accurately involves considerable expenditure, so that the manufacturing company does not feel justified in incurring all this expense until orders have been received for 50 sets of gauges, it is respectfully urged upon the members of the Association that they give the matter consideration, and if they will need one or more sets of these gauges, that they place the order soon, so that tools may be prepared and gauges furnished.

Walking to Save Time.

There are often good causes of complaint about delays with our suburban trains, and passengers are sorely tempted to make odious comparisons between train speed and the velocity of walking, but they seldom reduce their theories on the subject to practice. We do not appear to have a monopoly of slow suburban trains, for we find in an English paper of recent date that a passenger on a London suburban train got off and walked some time. The management of the railroad did not regard this action so philosophically as it would have been taken by an American railroad manager. The offending passenger, a Mr. King, was the editor of a country newspaper, and he publishes the correspondence that took place about his offense against the majesty of British law. The following are the leading facts:

Mr. Verrinder, the railroad manager, wrote that it had been reported to him that on Monday Mr. King alighted from the 4:48 P. M. train from Kingston while it was traveling between Vauxhall and Waterloo, and proceeded to walk up the line in the direction of Waterloo station. "I need scarcely point out," added Mr. Verrinder, "that in so acting you ran a very great risk of losing your life, apart from being guilty of trespass. Before instructing our solicitors to take proceedings in the matter I shall be glad to hear what explanation, if any, you have to offer for this extraordinary conduct." Mr. King, in his reply, said that he left the train between Vauxhall and Waterloo because he had a most urgent business engagement in London, which was broken through the delay of the train for nearly, if not quite, an hour on the up journey. Not only, however, did he alight because he wished to save time, but also because, he goes on to state, "I wished to enter an emphatic protest on behalf of business men and others regularly using your line, against the shameful way in which your directors ignore on Ascot week and at other race meetings the interest of your regular and really your best customers." He added that he was quite willing to admit the fact of trespass, and was quite ready to appear as defendant should the company deem it expedient to summon him. There has been no sign of a summons yet.

Scale of Ultimate Expense on Repairing Rolling Stock.

The Cleveland, Cincinnati, Chicago & St. Louis people are scrapping old cars and locomotives rapidly as they require heavy repairs. There are still on the system many old cars that are 30 feet long and under. When a box car of this length requires more than $45 worth of repairs, it is broken up. The same treatment is extended to box cars of the same contracted length that require $40 expenditure to put them in running order, while a prospective expense of $35 condemns a coal car and $25 a box car. This refers merely to the repairs on bodies.

For locomotives, a regular scale of repairs has also been adopted. Engines with cylinders 14 inches do not get more than $175 put out in repairs. Engines with cylinders 15 inches diameter may be repaired to the extent of $300, those with 16 inch cylinders may escape the scrap heap at at an expense of $550, and $1,250 may be put out in giving 17-inch engines a thorough repair.

The great ordnance works of the Bethlehem Iron Company, where $4,000,000 worth of work for the Government is being done, were visited one day last month by Hon. Benjamin F. Tracy, Secretary of the Navy, and Commodore Folger, of the Bureau of Ordnance. They witnessed the pouring of the largest casting ever made in this country, the head of a new forging press 180 tons in weight, and then saw a 13-inch rifle forged and two pieces of armor-plate flattened beneath the 125-ton steam hammer. The spectators stood on the platform of the open hearth steel furnaces opposite the casting-ground. The work was performed by the larger Whitworth forging press. The heated ingot was taken out of the gas furnace and placed beneath the powerful ram of the press. It was rapidly moulded and shaped, and it gradually grew longer and more slender beneath the force of the ram. The gun will be a 13-inch tube about forty or forty-two feet long. The party subsequently visited the hammer building, where a large and a small ingot were in the furnaces ready to be moulded by the world's largest steam hammer. The ingots were taken out and the Secretary witnessed the forging of a large and a small armor-plate. Both the Secretary and the Commodore expressed themselves as being highly pleased with the progress made on the Government contract.

A telegraph operator on one of the single track roads leading out of Pittsburgh had an experience last week that will last him a lifetime. The young man became careless, as dispatchers sometimes will, and he gave orders for a freight and passenger train moving in opposite directions to go to a certain station. When the trains had started the operator suddenly remembered that they could not reach the place without a collision. It was too late to countermand the order, and, in his agony, cold drops of perspiration ran down over his face. In describing his feelings afterward, he said he lived years in the few short minutes which would decide the fate of the trains. He was startled and relieved by seeing the engineer of the freight walk into the tower. The engineer had received his order, but when he reached a switch he had a premonition there was something wrong, and he turned in on a side track. His train was scarcely out of the way when the express thundered by. The next day the operator went to the superintendent of the road and told him what had happened, at the same time handing him his resignation. The manager looked at him for a moment and then said "Go back to your work my boy. This experience has been a lesson for you. I don't think it will occur in the future."—*Pittsburgh Dispatch.*

It may seem a small matter to adopt a coupler; it was a smaller one to adopt a standard screw thread; yet look at the labor which this involved. Mr. Chanute on the Erie was the first to attempt to bring some order out of the chaos that then existed. He tried to get the United States standard threads; he sent to the navy yards for gauges, but they did not agree; he applied to Pratt & Whitney for them, but they had no tools to make them. At last they made a special tool to do the work and daylight appeared and order is the result. So these matters had best be left in the hands of the railroads, at least so long as they are in a transition period. We believe the M. C. B. type to be the best. A better and more desirable form may be invented; no one can say. Meanwhile watch and nourish what we have. If 60 railroad companies representing 60 per cent. of the cars of the country should agree on some type, then the Interstate Commerce Commission might take the matter up.—*Mr. N. Forney before Railroad Commissioners.*

A large landslide took place in Southern California last spring, blocking the track of the Southern Pacific Railway. The mass of debris on the line was 200 feet long and from 26 feet to 45 feet thick along the center of the track, while at the top of the slope it was 120 feet thick. After many days' labor the line was cleared, but almost immediately afterward a second slide took place, again covering up the line. It was then determined to try and remove the mass by a jet of water, after the fashion pursued in hydraulic mining. This system proved most successful. The line was cleared in nine days, 9,000 cubic yards of material being removed in that time. The cost of the work was, however, somewhat greater than it would have been by using the ordinary methods, but there was a considerable saving in time.

The capacity of the machine shops of the Newport News & Mississippi Valley, at Paducah, Ky., is to be doubled very soon. The shops are entirely too small for the work, which is steadily increasing.

Work at Pullman.

The following is a list of the most recent orders received by the Pullman Palace Car Company for freight and passenger equipment:

One baggage car for the Denver & Rio Grande Railroad Company.

Twenty chair cars for the Chicago, Burlington & Quincy Railroad Company.

One hundred Pullman standard coal cars for the DuQuoin Transportation Company.

One vestibuled combination passenger and baggage car for the New York, Lake Erie & Western Railroad Company.

Five passenger and three parlor cars for the Columbus, Hocking Valley & Toledo Railway Company.

One combination baggage and mail car for the Toledo, Columbus & Cincinnati Railway Company.

Two passenger coaches for the Toledo & Ohio Central Railway.

Five first-class vestibuled coaches and five first-class coaches without vestibules for the Chicago, Rock Island & Pacific Railway Company.

Three first-class and three second-class coaches, and three combination passenger and baggage cars for the Rio Grande Western Railway Company.

Ten first class passenger and ten suburban coaches for the Chicago & Eastern Illinois Railroad Company.

One vestibuled combination passenger and baggage car and two sets of six-wheel trucks for the Old Colony Railway Company.

Joint Inspection of Cars.

This subject was discussed at the November meeting of the New England Railroad Club.

Mr. F. D. Adams did not hesitate to say that he did not believe that joint inspection could be made a success. They had tested it quite thoroughly for a year at considerable cost without getting the satisfactory service they expected and for that reason it had been abandoned.

Mr. J. T. Chamberlain did not think that joint inspection was desirable. They have joint inspection at three places, but they are cases where the business can be done just as well by one man as by two, and it saves expense, and with limited business there is no difficulty about one man doing justice to two interests, but where the work to be done is extensive enough to call for the employment of 30 or 40 men it is questionable that justice will be done all the employers of joint inspectors. Mr. Chamberlain continued: There was a trial of joint inspection on the Boston & Albany for about a year and they were in a muddle all the time. In great centers like Chicago, Buffalo, Kansas City, and some other points in the west where the inspection is of great magnitude, more so than it is in the eastern part of the country, the railroads may see their way clear to adopt this method of economy and the speedy transportation of freight, but I learn that in some places it gives rise to many disputes and disagreements among the inspectors. I think that the general adoption of joint inspection may lead to the passing of cars from one road to another, and their finally making their way east without an authority to repair the damage done to them. I know that there are many railroad men in the country who are firm believers in joint inspection, but from my standpoint I am not convinced that it can be satisfactorily conducted, except in certain peculiar cases.

Mr. Adams considered that it was very difficult to find a man who will work for two persons with equal zeal and integrity. If he favors one more than the other joint inspection will not be conducted with justice and fairness.

Mr. J. W. Marden has joint inspection at some points on his road and he has tried to regard the system as favorably as possible, because it was likely to be more economical, but he had not succeeded in convincing himself that joint inspection was satisfactory. He believed in uniform inspection, and thought it would be a good thing if one man could be appointed to have authority over all the inspectors between Boston and Chicago to instruct them in the methods of making inspection and concerning defect cards. Thought it was a strange thing that a car could leave Boston with some trifling defect which passed one or two inspectors and then come to a place where it was stopped for the defect. Uniform inspection was the proper remedy for this. Had read the articles in the railroad journals advocating joint inspection. but he was not convinced as to its advantages.

Mr. Angus Sinclair had advocated joint inspection, because he thought it was desired by the majority of railroad companies. During a recent trip, when he made inquiries about the working of joint inspection, he became convinced that it was more satisfactory to the large roads than to the small ones. The larger interests get the best of the small ones. In regard to the vexed question of old defects, he wished to hear an elucidation of when a defect that would call for a card under the interchange rules became old enough to be entitled to pass inspection without a card.

Mr. ADAMS: I am glad that Mr. Sinclair made that last inquiry, for it is a matter which I have been interested in myself. I have always claimed that a party breaking a car or doing it an injury was responsible for the breakage, but we have found in our experience that the party who did the damage will often shirk that responsibility, especially where the damage is not so great as to render the car useless, and the injury is not apparent at first sight. The matter of old defects in cars is probably the cause of more trouble than any other thing in inspection. There are some roads which will damage a car, and if they can get that car off on to another road without putting a card on they will do it every time, and claim to be thoroughly honest, though this is entirely wrong. The Boston & Albany road have always been ready if they damaged a car to be held responsible for that damage.

Mr. MARDEN: In answer to Mr. Sinclair's question about old defects, I would say that it is our custom to receive cars with old defects if they are safe to run. If a car is offered us that is newly broken we ask the road to card it to us, and expect them to be responsible for it. It is unfortunate for the older roads that they have a large number of cars built many years ago with sills not adapted to the larger loads which are now carried, and many of those sills have become cracked; they are not easily seen, and they pass until some road happens to find them and cuts them out. Now the roads owning such cars should take care of them. The resposibility in some way should be put upon the road where the defects originate. As regards new defects, the road receiving a damaged car may make the necessary repairs and charge them to the road owning the car. We are making a little move in that direction by having brake chains and springs and other things chargeable to the owner of the car. Under our present rules we are subject to much expense owing to the fact that a car is liable to be stopped at different points along the line between here and Chicago on account of old defects, and this also leads to much delay. A system of uniform inspection would do much toward overcoming this and other troubles which now exist.

Mr. LAUDER: I am willing to put myself on record, that I am opposed to any system of joint inspection. I don't believe in anything joint; I believe in each road running its own business.

Care of Steam Heated Cars at Terminal Points.

This subject was discussed at the November meeting of the New England Railroad Club.

LEARNING OUR NEEDS.

Mr. J. N. Lauder said that some two years ago the question of taking care of our cars on one division of our road came up, that division being heated with steam. At various points, as a makeshift, we used old locomotives; at other points we used road locomotives; but at some of the leading points we put in steam plants, notably in Boston. Now, what we did in the way of putting in these steam plants that winter, with the exception of the boilers and boiler house, had to be all torn out and done over again; consequently the expense of putting in our pipes and everything to convey steam from our central plants to the points where it was necessary to do the work was thrown away. We had to put our steam pipes in the ground, putting them in perhaps as well as anybody would. They were put in wooden boxes 8 inches square, I think, inside measurement, made of 2-inch plank, properly fastened together, and inside the pipe was placed, covered with some non-conducting material. That winter we managed to get through and keep our cars in fairly good condition with that system. But one morning we found our whole yard two or three inches under water. There was an exceptionally high tide and also a great storm, and the storm and the tide together flooded our yard. The consequence was we had no steam, and for that period of

time when we were troubled with water, of course, our cars were not properly heated.

KIND OF PLANT NECESSARY.

Early last spring we went to work on an entirely different plan, ripped this all out, undid everything we had done the summer before, and arranged to keep our pipes out of the ground, starting at the boiler house and carrying the pipes high enough to pitch them gradually to the farthest point where we needed to use steam, and we got a very much better system and much better results. So far this winter it has worked admirably; we have no trouble to get dry steam and hot steam at any point; no trouble from condensation more than is incident to carrying steam long distances, however well protected.

There are many cases where the steam has got to go underground. We have put in two plants on our central division this year, one this side of Kneeland street, and the other near Dover street. The drawbridge necessitated putting in two plants. In the one at Kneeland street we were obliged to go a portion of the way underground, and we got out of the ground and carried our pipes into the train shed at the earliest possible moment. We have had it running several weeks, and it has given us very good results. At Dover street we were obliged to go into the ground all the way owing to the very peculiar conditions existing at that place.

DIFFICULTIES TO BE OVERCOME.

Now steam heating men and railroad men generally interested in this matter have perhaps a very inadequate idea of the difficulties of heating cars by steam from the locomotive on some of our roads, notably the Old Colony and the Boston & Maine, which are made up largely of branches in the vicinity of Boston. Both roads have a vast number of cars to be taken care of during the night and got ready for the morning trains coming into Boston. In the case of the Old Colony we have cars at 41 different points during the night, and those cars have to be got ready to bring the passengers into Boston or to go to other points. The question of keeping the cars warm at terminal points is a very serious one, and the putting in the permanent steam plant and building the boilers is a large expense; and taking steam from the locomotive to do the same work is a still greater expense.

How can this heating best be accomplished? At some points cars can be allowed to cool off, provided they are warmed with straight steam, not in connection with a Baker heater. But if the system is one where a Baker heater is used, or in other words is a hot water system, and not a steam system, the case is different. Where the cars are set off at night and stand eight or nine hours until the next morning, however warm they may be when they are left, they will be entirely chilled and everything will be frozen up solid before morning in a cold winter night, so that where there is not straight steam available the necessity for having them kept warm is imperative. Where straight steam is used the couplings can be unfastened and the water be allowed to run out of the cars at night and they may be allowed to cool off, and in the morning the locomotive can be got out an hour before the time for starting, and the trains can be got ready in time for use. What is right for one point may not be for another. You will see, from my explanation, that what is right for one system of continuous heating may not be for some other system of continuous heating, and it is a serious question to us what is the best thing to do under the varying conditions at different points. I have seen, during the last two years, a good many cases on our own road which required a good deal of study before a decision could be arrived at as to what was the best arrangement that could be made; and so I think it well to have this matter discussed, so that we may get all the information we can for the benefit of our roads. Many of the roads would have very little difficulty in deciding these points, because they are not situated as some of the Boston roads are. I might add another road to the two I have mentioned, and that is the Fitchburg, which has a large number of branches, and the Albany has also many branches, though I don't think they have as many terminal points where their cars are stationed over night as the Boston & Maine and the Old Colony roads.

QUANTITY OF STEAM REQUIRED.

Now as to the amount of steam it takes to do the work, no one can tell anything about that except by actual tests. We built a boiler house and put in two 54-inch upright boilers at Dedham two years ago, thinking that would furnish ample steam to take care of our cars over night at that place, but we had to supplement them with a locomotive, because those two boilers would not furnish steam enough to keep the cars warm from midnight until five o'clock in the morning. We have 65 to 75 cars there over night. Those cars have got to be kept warm and made into trains in the morning from five o'clock to half-past seven. Now we have four 54-inch upright boilers there, just to keep the cars warm while they are standing there on the sidings. That fact shows that there is a good deal to this question. And there is also a good deal when it comes to dollars and cents.

COST OF HEATING CARS BY STEAM.

Two years ago I made a careful estimate in detail as to what it would cost to get the passenger trains of the Old Colony road, including cars and locomotives, ready for steam heating. Necessarily, a large number of my figures were estimates, but a large number were actual known facts. The figures can be criticized, and if they are wrong can be made right. I also made an estimate of a number of men who would be permanently added to our pay roll. I found that it would cost to get our trains ready to be heated by steam $198,000, and that 76 permanent men would have to be added to our pay roll. I put them at $2 a day, which I think is a conservative estimate, as you have to have men of some skill to trust with steam boilers and steam heating. These figures are certainly low enough, and it shows what enormous expense the railroads have to incur in these matters, even if they make no mistakes. My object in ventilating this matter before this club is to prevent, as far as I can, the mistakes we made, although those mistakes did not involve us in very large expense. This question of taking care of cars when not in use on the road and at terminal points, is by far the most important one, I think, connected with the continuous heating of railway trains.

ALL THE ROLLING STOCK EQUIPPED.

One more thing I will say, and that is, in equipping a road for steam heating, we consider it absolutely necessary—imperatively so—that every locomotive on the road should be equipped, both forward and backward, for steam heating. There is not an engine on our road but what is liable to be hitched on to a passenger train at some time, to cover some emergency; and to make the system entirely available for a passenger road, we consider that every engine should be so equipped, so that it can be coupled on either for backing or pulling ahead.

Treating Feed Water with Chemical Compounds.

Mr. J. N. Barr, Chicago, Milwaukee & St. Paul, read at the Western Railway Club a paper on "Treatment of Waters Used in Locomotives to Prevent Incrustation." The result of his observations was that the modes of treatment of feed water by chemical and mechanical devices are both beneficial, if intelligent care is exercised in their use.

There seems to be a general impression with people using these processes and devices that there is no intelligence required to obtain good results. If the proposition should be made to the members of this club that there was no intelligence required in the matter of firing a locomotive, its absurdity would be at once appreciated, as all know that efficient firing of a locomotive consists not merely of shoveling coal into the firebox, but that to obtain the greatest success the fireman must at every point use judgment and intelligence, and that very slight negligence on his part will result in the extravagant use of coal or inefficiency of the locomotive. This same remark will apply to almost every operation connected with the handling of motive power on a railroad, and there is no reason whatever for supposing that the use of boiler compounds and mechanical devices for preventing boiler incrustation is an exception to the rule. The writer does not propose to go into any general discussion, but the intention is to present some cases in which the use of boiler compounds has resulted in great benefit.

In order to deal with the subject intelligently Mr. Barr had analyses made of the feed water on a division, and a compound mostly of potash and soda was prepared to suit the impurities in the water. With the use of this compound they were able to entirely prevent the formation of scale. An engine that had run 122,000 miles was found to be as free from scale as when she first went out new. Careful attention must be paid to washing out when using the compound. It is also well for the engineer to use the blowoff cock freely.

They are now extending systematically the use of these compounds to other divisions, and Mr. Barr believed that the worst water on the road would eventually be treated successfully.

In the handling of this compound, or in the use of any other compound or device for preventing incrustation, the details must be carefully worked out, and as much care and attention must be given to this matter as to any other of the numerous operations on a railroad in order to reach success. Attention should also be called to the fact that with the various water supplies the character of the water frequently changes, thus necessitating a change in the amount of compound required. This necessitates a careful watch of the boilers. They should be inspected at every washing to determine if there is a tendency to the formation of scale; and if any tendency of this kind is detected, the quantity of the compound used should be increased until the formation of scale is again overcome.

Unless this care and attention be given the matter the use of this compound will be at the best inefficient and possibly useless.

Safety Appliances for Railways.

A committee of Railroad Commissioners held a hearing in New York last month to obtain the views of railroad men and others on safety appliances for railroads.

Mr. George C. Crocker, of Massachusetts, presided and beside him there were Messrs. John C. Hill, Virginia; Spencer Smith, Iowa; Wm. E. Rogers, New York; and George H. King, South Dakota. Mr. Edward A. Moseley acted as secretary.

Mr. Crocker made a statement based on correspondence which he had had with railroad companies. The total number of freight cars was said to be 978,161. The total number of these said to be equipped with automatic couplers was 129,304. Of these 118,928 were said to be of the vertical plane type.

Of the total number of cars reported 110,127 were said to be equipped with air brakes, most of them the Westinghouse automatic.

The total number of locomotives reported as owned was 27,159, of which 17,000 were said to be provided with driving wheel brakes.

Sixty-nine roads, representing 13,014 miles, replied that they are in favor of national legislation on the subject; 88 roads, representing 46,791 miles, want voluntary action by the railroads; two roads, representing 139 miles, want state legislation; 17 roads, representing 11,915 miles, want the Master Car Builders' style of coupler. 10 roads, representing 4,829 miles, want different couplers for different roads; 15 roads representing 9,447 miles, say the matter is still in the experimental stage; 145 roads, representing 38,985 miles, express no opinion.

Chairman Crocker said that, in the opinion of the committee, imperative action should be taken by Congress to hasten and insure the equipment of freight cars throughout the country with uniform automatic couplers and train brakes, in view of the fearful sacrifice of human life that is now going on in every direction. During the year ending June 30, 1889, there were killed in the operation of the roads 1,972 trainmen, and 20,028 were injured. During the following year 2,451 were killed and 22,390 injured. In coupling or uncoupling cars there were killed during the year ending June 30, 1890, over 300, while 6,757 were injured. During the following year 369 were killed and 7,841 injured. Chairman Crocker invited expressions of opinion by those present as to the best course to be recommended to Congress.

Mr. E. L. Coffin, of Iowa, claimed to represent 20,000 railroad employees, said that his friends were unanimous in asking for a law requiring uniformity in car couplers and air brakes.

Mr. J. C. Cummings, member of the Brotherhood of Locomotive Engineers, said that the brotherhood was in perfect sympathy with the movement of the committee in favor of safety appliances.

Col. Haines, President of the American Railway Association, insisted that railroad companies were doing all they could to introduce safety appliances, particularly automatic couplers and air brakes. He took exception to the figures quoted by Commissioner Crocker, and held that there were at least 200,000 automatic couplers in use, the Janney people having applied 100,000 couplers and the Gould 40,000. He did not think that legislation could hasten the application of safety appliances, for the expense to be incurred is enormous. The 1,000,000 cars yet to be equipped with automatic couplers would cost to the railroad companies at least twenty-five millions of dollars.

Concerning air brakes, Col. Haines said that all new locomotives were being equipped with driver brakes, but train brakes are not as far ahead as the coupler or the engine brake. The present construction is perfectly satisfactory, but it cannot be used without a close coupling, so that the coupler must be first applied. Then, too, it involves the expenditure of just twice as much money as the coupler, and while the railroads might not oppose legislation looking toward the more rapid introduction of the train brake, still it is doubtful if matters could be forced much more rapidly than they are naturally running.

Mr. M. N. Forney represented the Committee of the Railway Master Mechanics' Association on car couplers and safety appliances. He considered that the type of coupler adopted by the M. C. B. Association was right, but that the details were imperfect. It is undergoing development and while the coupler is going through this process he considered it would be a mistake for legislation to interfere.

Mr. E. B. Thomas, general manager of the Erie, said that 60 per cent. of their locomotives were equipped with air. Of the freight cars, 18 per cent. have the M. C. B. standard coupler, which is put on all new cars and on all those sent to the shops for general repairs. As soon as it can be done, orders will be issued declining to receive cars for transportation over the road that are not equipped with automatic couplers and air brakes.

Mr. Lucius Tuttle, New York, New Haven & Hartford, said that his company had adopted the Janney coupler and were equipping their cars with automatic couplers and air brakes as fast as possible. More than half of their cars are now equipped with air brakes.

Mr. Myers, of the Richmond, Fredericksburg & Potomac, was in favor of the M. C. B. coupler.

Mr. C. W. Bradley, West Shore, said that all their engines had air brakes, or were being equipped with them. All stock cars and line through cars are equipped with air brakes, and all new cars and those coming into the shops for general repairs have the standard coupler fitted upon them. The western connections of the West Shore were doing as well with couplers and air brakes. As soon as possible an order will be issued refusing to accept cars that are not fitted with automatic couplers and air brakes.

Mr. Frank Sweeney, Grand Master of the Switchman's Mutual Aid Association, considered that the variety of couplers now in use was an imposition upon switchmen, and rendered the work extremely hazardous. He favored legislation to enforce uniformity in the height of car drawbars. His association had gone on record as preferring the link and pin to the M. C. B. coupler.

Mr. J. H. Sweeny preferred the link and pin coupler, and considered it safer than the M. C. B. type. He objected to the latter on the ground that its use did not obviate the necessity for going between the cars.

Mr. J. H. Hall, of the United Order of Railroad Employés, took decided ground against the M. C. B. coupler, and held that it increased the danger of switching cars. He favored the link and pin.

Several other switchmen gave testimony of a similar character.

Mr. J. T. Chamberlain, master car builder of the Boston & Maine, found that switchmen were invariably opposed to the M. C. B. type of coupler and favored the Safford. He objected to the M. C. B. coupler owing to the great cost of maintenance. The knuckle had an inherent weakness.

Mr. W. McWood, Grand Trunk, was opposed to the M. C. B. coupler owing to the experience he had with it. He objected to this type of coupler because it was very susceptible to damage. He believed that a more satisfactory automatic coupler could be made on the link and pin design.

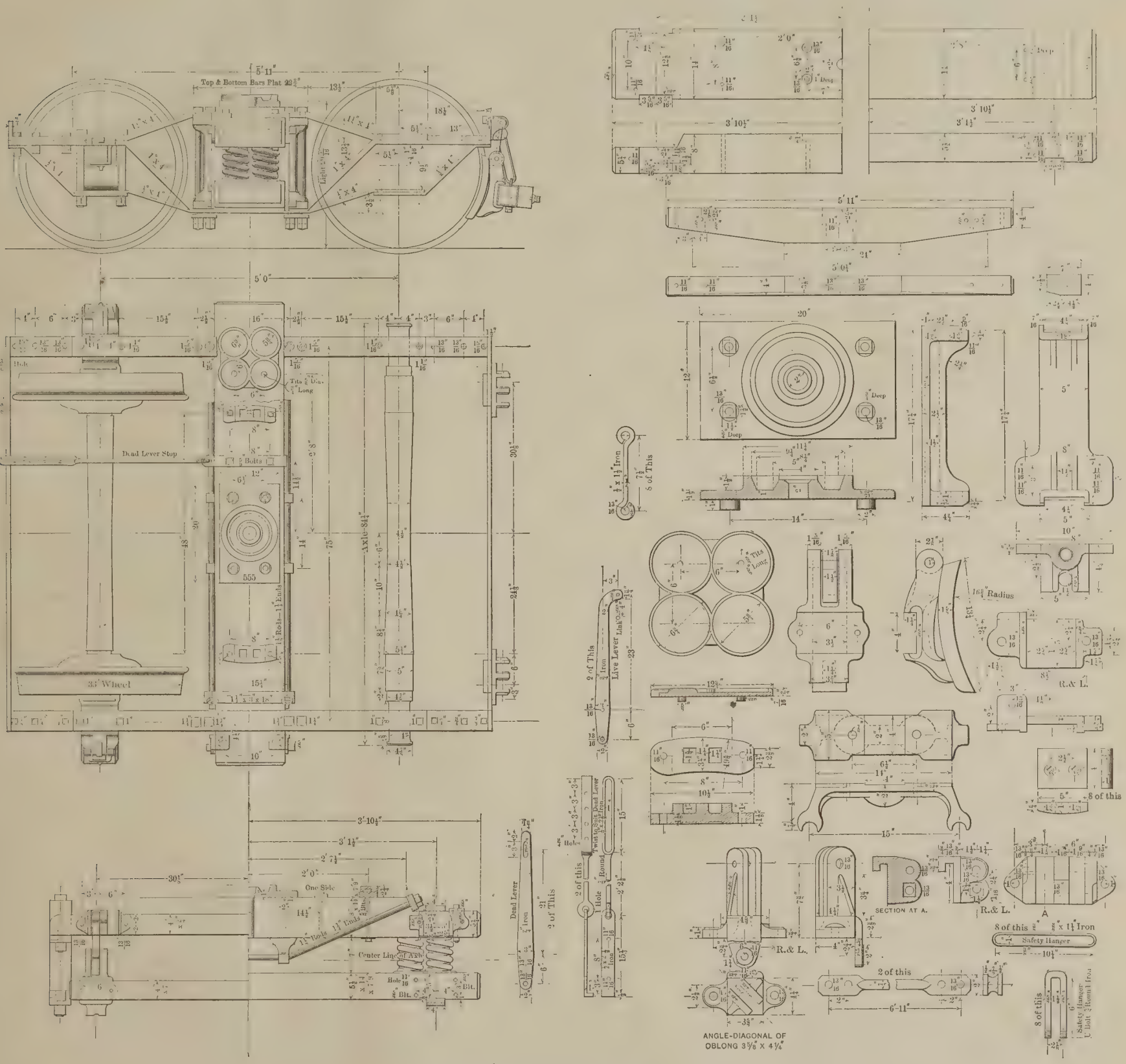
Mr. G. W. Rhodes, Chicago, Burlington & Quincy, considered that the vertical plane coupler was the best of any type yet devised. It should be taken up and developed. The breakage of the couplers in use is appalling and while this state of affairs exists he did not consider it would be wise of legislation to interfere. The road he represents is equipping cars with automatic air brakes and couplers as fast as possible.

Mr. Coffin finished with a hysterical scream in favor of immediate positive legislation to compel railroad companies to adopt air brakes and automatic couplers.

Leeds Freight Car Truck.

The annexed illustrations show a side elevation plan of several sections and the leading details of what is now the standard freight car truck of the Louisville & Nashville Railroad. The truck was designed by Mr. Pulaski Leeds, superintendent of motive power of the road, and unusually great attention has been bestowed upon the details with a view of having a truck that would ride well and yet be durable and light on repairs. It is of the rigid center type and has the brakes hung outside. At a meeting of the Southwestern Railroad Club Mr. Leeds said respecting this truck:

"As to safety in running, any of us would hesitate to say that a truck built so rigid that all the wheels were held in the same plane regardless of whether one of them was supported or not, was as safe as the passenger truck with each wheel free to follow every depression by the vertical play of the box in the pedestal. Then why is it safe to clamp these wheels to a rigid body in such a manner as to make it impossible not only for one wheel but any of them to accommodate themselves to the conditions of the track, even on a straight line? This is, in my opinion, poor practice, as the strain thrown on hangers is about the same when the wheel strikes a low joint as though it was a suspension bolt suddenly made to carry the entire load on that wheel, our system of hanging below the center of the wheel making the connection rigid. But the great danger, as my observation apparently teaches, is in going on to a curve or coming off one, either on to a straight line or on to a reverse curve, with the truck clamped rigidly to the body by the brakes being set. On a straight line, the normal conditions are that each wheel is held equidistant from the body, but striking a sharp curve with great elevation, both the canting of the truck and the position which the body takes (according to speed) brings the truck and body closer together on the outer side than the inner if the brakes are not set, and tries to do so if they are; under these conditions the brakes must slip on the wheels (which they can scarcely do), or else, failing to break the hangers, must carry the weight of inner side of the truck while going around the curve in just so far as the car has a tendency to right itself or assume a perpendicular."



LEED'S FREIGHT CAR TRUCK.

Texas Railroad Club.

The meeting of master mechanics and master car builders, held in the office of the joint car inspector at Fort Worth, Nov. 16, for the purpose of forming the Texas Railway Club, was called to order by Mr. John F. White, master mechanic of the Fort Worth & Denver City Railway, with the following gentlemen present:

John F. White, master mechanic, Fort Worth & Denver City Railway; W. P. Siddons, superintendent car department, International & Great Northern Railway; A. S. Douglas, superintendent motive power, Texas & Pacific Railway; W. D. Minton, master car builder, Texas & Pacific Railway; John Doyle, foreman car department, Missouri, Kansas & Texas Railway; Frank McGee, foreman car department, Fort Worth & Denver City Railway; T. J. White, foreman car department, Texas & Pacific Railway; Thomas Inglis, master mechanic car department, St. Louis & Southwestern Railway; R. E. Masters, manager Marshall Car Wheel Company; B. Neil, joint car inspector; W. M. O'Herin, general master mechanic, Missouri, Kansas & Texas Railway; C. H. Burke, master mechanic, Fort Worth & Rio Grande Railway; James McGee, master car builder, Houston & Texas Central Railway.

The following officers were elected:

John F. White, master mechanic, Fort Worth & Denver City Railway, president; A. S. Douglas, superintendent motive power, Texas & Pacific Railway, vice-president; Thomas A. Kuntz, stenographer, mechanical department, Fort Worth & Denver City Railway, secretary; Robert E. Masters, manager Marshall Car Wheel Company, treasurer.

Board of directors; W. P. Siddons, superintendent car department, International & Great Northern Railway, chairman; William O'Herin, general master mechanic, Missouri, Kansas & Texas Railway; Thos. Inglis, master mechanic, St. Louis & Southwestern Railway; J. J. Ryan, master mechanic, Galveston, Harrisburg & San Antonio Railway; James McGee, master car builder, Houston & Texas Central Railway.

The object of this club is to bring together the officials of the motive power and car departments of all railroads in and running into the State of Texas, for the purpose of discussing the workings of the mechanics' department and making united effort for the protection of Texas railways in the interchange of cars.

Only officials from the mechanical department can become active members of this club, but it is the purpose, after the club is fully organized, to extend invitations to the officials of the transportation department, who will be elected honorary members.

After effecting permanent organization the meeting adjourned to meet at Fort Worth some time in January, subject to the call of the president, when it is expected to have the largest gathering of mechanical men that ever assembled in the State of Texas.

A press dispatch gave one morning lately a most sensational account of an unmanageable train on the Louisville, Evansville & St. Louis Railroad. The trainmen lost control of the train near New Albany, doubtless owing to lack of proper brakes, and dashed into that place at a high rate of speed. There it found a train standing on the main track and a fearful smash ensued. Two men were terribly injured.

The "Alley" elevated road in Chicago will be equipped with the Black switch and target on all turnouts and crossovers. This switch is used on the Manhattan and the Brooklyn elevated roads, and is the design of Mr. Black, Roadmaster of the Manhattan. This device combines the use of a positive lock, switch and detector bar and a target, all operated with one movement of one handle.

NATIONAL CAR AND LOCOMOTIVE BUILDER

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EDITORIAL ANNOUNCEMENTS.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Special Notice.—*As the* CAR AND LOCOMOTIVE BUILDER *is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion must be received not later than the 25th day of each month.*

To Subscribers.—*We occasionally receive complaints from subscribers that their paper is not received regularly. When cause for such a complaint exists, the blame lies with the mails or with the method of delivery, for the paper is mailed regularly to every subscriber each month without mistake. Any subscriber who fails to receive his paper ought at once to notify the postmaster at the office of delivery. When a subscriber changes his address he ought to notify this office at once, so that the paper may be sent to the proper destination.*

OUT AND IN.

For nearly seven years the writer has been on the editorial staff of this journal, half of that time being the only editor. Month after month he has been in close communion with the readers of the NATIONAL CAR AND LOCOMOTIVE BUILDER, and has come to regard them very much in the light of personal friends. With this issue he will finish his editorial connection. Before stepping out he wishes warmly to thank the readers and patrons of the paper for their uniform courtesy which carried encouragement, their kindness which has been so helpful, and for the sympathy which has done so much to render his labors successful and to make the work a pleasure. Without these aids an editor's life is likely to be very weary and his endeavors barren. Before leaving the editorial chair the writer would cordially bespeak for his successor the good will and kindness of the readers which have done so much to convert his own toil into pleasure.

ANGUS SINCLAIR.

Mr. George H. Baker, lately fuel expert on the Southern Pacific and known to our readers through various contributions on fuel economy, at this date takes the position of editor of the NATIONAL CAR AND LOCOMOTIVE BUILDER. Mr. Baker entered upon railroad work when he was 16 years old and has followed the business for 16 years. He rose on the footboard to be an engineer on the Wabash, where he ran for six years, and was noted for the record he made in fuel saving. In 1888 he left that road to become instructor of engineers and firemen on the Chicago, Burlington & Quincy. He wrote for the use of the men a "Manual of Instruction for the Economical Management of Locomotives," which is one of the best books of the kind ever published. Mr. Baker went to South America about two years ago as master mechanic of the Uruguay State Railways, but returned after about a year of experience in that country. He is an industrious student of railroad problems and comes to the editorial chair with a rich fund of experience to draw from.

DISCORD BETWEEN DEPARTMENTS.

A master mechanic recently dilating on a communication in our columns against home-made tools, and on his position of being required to make bricks without straw, remarked: "It is useless to say that we must have new locomotives and new cars, and that it is cheapest to buy them. The manager simply pays no attention to our needs. His mind is fully occupied with disputes about rates, and with the tendencies of the passenger and freight agents to accept business at a price that is a loss to the company. The manager considers that he has all he can attend to without looking into the needs of the mechanical departments. All he does in relation to them is to insist that the pay rolls and the bills for material shall not exceed so much per month. If either goes above his figure he is quite ready to intimate that if the present head of the department lets the thing happen again there will be a change made. With all that he is ready to back up with a letter of censure the complaints of superintendents when engines are not always ready to pull extra trains, or when cars are waiting in side tracks for repairs when they are badly wanted to transport the grain that is waiting at every station. This being the condition of affairs we have to rebuild locomotives from scrap, with many headaches to help lubricate the operation, and cars have to be patched till it is a mystery how some of them ever pass an interchange inspector. In relation to freight cars, it would be a good thing if the general manager would pay more attention to how they get damaged than to growling about the expense of repairs. We have a large yard that is on a grade, and the switchmen seem never to heed how hard the cars come together so long as they keep on the trucks. The yardmaster is a bigger man than the president, to judge by the gingerly way in which the management treats his reckless destruction of property, and one department has to suffer inconvenience and its officers are subjected to humiliation and heartaches because others are ruled by really incompetent men."

Most men familiar with the inside working of the different departments with the rivalries and jealousies that exist between them will sympathize with the plaint that we have reported. On many railroads there is silly jealousy between the different departments and even between the same departments on different divisions, but the mechanical department gets the burden of all other annoyances to carry. Where managers and superintendents rise from the operating department, which is generally the case, their sympathies are nearly always against those who have to keep locomotives and cars in running order. This sentiment really does great injury to the interests of the company. The true remedy would be in bringing the heads of the departments frequently together for the consideration of questions that caused difficulties and misunderstandings. "Let us reason together" has brough harmony out of discord ever since the world began, and the railroad general officers could make good use of the principle by getting the officers of their different departments together occasionally to talk over the difficulties that lead to animosities and personal friction. Misunderstandings that frequently have the worst influence on the interests of a railroad company would nearly always be straightened out by personal contact and information. When a mechanical officer manages to put the operative department to inconvenience and saddles the blame on the officers for want of foresight, he forgets that he is punishing the company, that pays him, a great deal worse than he is spiting his rival. It is the same when a trainmaster manages to saddle blame upon the mechanical department for something that mutual co-operation could have avoided. The most inexcusable kind of blind spite service at present prevailing is where yardmasters permit reckless handling of cars that are equipped with draft bars that do not meet the approval of the men doing the switching. The destruction of property resulting from this cause is certainly embarrassing to the managers and others who have indorsed the hated devices, but the men who enjoy the triumph that comes from unscrupulous performance of their duties have no right to the employment they hold. If railroad managers would act more as judges and decide on the merit of cases as shown by unprejudiced investigation there would be less pulling in opposite directions indulged in by the officers and men of the various departments.

CARE OF AIR BRAKE RULES.

From the opinions we have heard expressed by many railroad men, we think there is general agreement that the most important subject brought before the last mechanical conventions was the report on Air Brake Standards and Care of Air Brakes on Freight Cars. The importance of this subject is not gauged by the attention it received in the meetings, but upon the importance to railroads of having rules like those reported on in the hands of the men responsible for the handling and care of air brakes. The rules were prepared by a joint committee of the Master Car Builders and Master Mechanics' associations, and extraordinary care and industry were devoted to making the rules as nearly perfect as possible. The rules were not framed on theoretical abstractions. A number of railroads that have air brakes on a sufficient number of their freight cars to be able to handle most of their freight trains by air, had compiled codes of rules for the care and handling of freight train brakes, every article of the rules being a recommendation of experience. The joint comittee having in charge the framing of rules for the care of air brakes collected all the codes of rules in use by the various railroads and used them in compiling the report that was submitted to the associations. The rules submitted incorporated all the most valuable information collected up to that time on the care and maintenance of air brakes. That the instruction contained in these rules was kept back from the trainmen of the country was, we consider, the greatest mistake ever made by the Master Car Builders' Association.

When the objections were raised that led to the practical rejection of the report, and referring it to a new committee, we were not particularly struck with the importance of the objections raised against the rules, but we supposed that others would be forthcoming when the rules were submitted for discussion at the railroad club meetings. We have waited patiently till the whole charge against the rules has been made public. They have been exhaustively discussed at the Western Railroad Club, and the impression we have received is, that the objections to the rules are of the most trifling character. In a full meeting of practical railroad men familiar with air brake practice, there are likely to be as many supporters as opponents to the articles most vigorously opposed.

In the discussions there were evidences of the hypercritical faultfinding that makes many discussions of the rules of interchange of cars so tiresome and unprofitable. The tendency was strongly toward useless elaboration of plain rules, elaboration that brings confusion instead of comprehension. The trend of thought in this discussion reminded us of a conversation between two colored brethren. One said, "Look, George Washington, at dat big melon." The other remarked, "De magnitude of dat melon is of de most stupendous proportions I'se eber witnessed." That made the case perfectly plain. The stacking up of superfluous words and phrases, even if they are in few syllables, is a dangerous practice in making rules for men who have not studied metaphysics. The real difference of opinion on the rules became concentrated on two articles. In one case a change was proposed to require the engineer to exhaust all the air from the trainpipe in trying the brakes; the other case called for a change of the article that proposed making the piston travel four and eight inches. This was a very small mole hill to magnify into the mountain that led to the rejection of the rules.

We fail to see where there would be any advantage in exhausting all the air from the trainpipe. It was said that this would enable the engineer to judge by the volume of air exhausted how long his train was and that it would let him know if part of the train was accidentally or by mistake cut off from the air supply. If the engineer was to exhaust the whole of the air from the pipes every time he applied the brakes the information he gained before starting would be available, but as he would not be likely to exhaust all the air till the next time he tested the brakes, it looks as if the practice of doing it at the beginning of the run would be a useless waste of air.

The discussions show that there is very little likelihood of an agreement among the contending critics as to the proper travel for the air cylinder piston. The committee's recommendation of limits between four and eight inches meets the requirements as well as any of the amendments proposed. If there were a certainty that the brakes would receive attention at every division point, and that there would be a force of inspectors at these places prepared to readjust the piston travel, it would be all right to establish short variation in the limits of travel. But this is not the way freight cars are attended to. They run long distances without receiving any attention whatever, and any rule to shorten the piston travel is likely to increase the number of air brake cars to be found running with the piston striking the head. It is highly important that these rules should be of universal application. The rule making four inches the first point of piston adjustment was adopted from the practice of mountain railroads. Before beginning the descent of a long steep grade with a heavy train it has been the custom for train men to stop and adjust all the brakes at four inches, in order that the work of braking might be done with the least possible expenditure of air. That this practice has been successfully followed for years without any inconvenience being experienced through the pistons not covering the leakage groove proves how little cogeney there is to the objection raised against adjusting the pistons with four inches for the beginning of the travel. When the whole question of airbrake rules is dispassionately considered, there is very little justification to be found for the objections that prevented the adoption of the Joint Committee's report for at least a year. This is the conclusion now arrived at by railroad men generally.

REMEDY FOR FEED WATER IMPURITIES.

We publish elsewhere an abstract of a paper read by Mr. J. N. Barr at the Western Railway Club on "Treatment of Waters Used in Locomotive Boilers to Prevent Incrustation." There is no subject we are familiar with connected with locomotive operating that is more in need of intelligent discussion than this one. To be sure, feed water impurities, boiler compounds and kindred departments of the subject have been written on and discussed at great length for the last thirty years, but still there continues to be great ignorance as to what can be done to prevent the impurities in feed water from prematurely ruining the furnace sheets and flues of locomotives. Mr. Barr strikes the right note in insisting that intelligence and care are of the first importance in the use of processes and devices for the purification of feed water. We have devoted a great deal of attention to this subject for fifteen years.

We have watched the rise and fall of many devices that promised to neutralize the evil effects of lime salts in the feed water; we have had good opportunities of learning what was going on in treating water with chemical compounds

of various kinds, and the general impression received has been that most of the failures resulted from the absence of the intelligence and care which Mr. Barr holds worthy of first consideration. There is too great a tendency among railroad men to let everything attend to its own wants. If the water that is put into a tender every fifteen or twenty miles had some craving for the mixture that will precipitate lime, and could go up and take its supply out of the box on the tender, chemical compounds would be a fair success. As the case is different, and the water has to be used as it comes from its calcium bed, unless the fireman, overcrowded with other duties, happens to think to throw some of the compound into the tender every time he takes water, the mixing is not done and the chemical means of improving the water is declared a failure. It is the same as roast beef failing to appease hunger when it is left to spoil in the kitchen. The same may be said of the numerous mechanical purifiers that have been applied to locomotives on so many railroads. The usual report is that the device worked well at first, but after a time its performance was unsatisfactory, and finally it was abandoned as useless. The true history of such an appliance was that it worked well while it was a novelty and received the care and attention necessary. As the novelty wore off and neglect began to be substituted for care the performance was not satisfactory. It was then merely the question of a little time till the purifying devices would get filled up with mud and then the whole thing was no better than a lump of hard clay.

The presence of large quantities of lime salts in most waters used for locomotives will always keep up an interest in the means of preventing the impurities from injuring the boilers. The first step toward applying remedies successfully is the making of every person concerned understand that care and attention are the most important requirements in working out the cure of the evil.

STANDARD COUPLER GAUGES.

In another column will be found the copy of a circular issued by Mr. John W. Cloud, secretary of the Master Car Builders' Association, on coupler gauges. Some months ago the executive committee of the Master Car Builders' Association made arrangements for the adoption of gauges for car couplers that would ensure the maintaining of interchangeability of the various couplers made to conform with the M. C. B. contour lines. To carry out a plan of this kind successfully it is of the first importance that the gauges used should be of the same size. The only way to keep them of the dimensions agreed upon is to have them made by experts on precise measurements. Recognizing the importance of this the executive committee invited the Pratt & Whitney Co., of Hartford, Conn., to make the gauges, and that company undertook to do so on condition that the railroad companies and car coupler makers should order at least fifty sets. This was a very fair offer for the manufacture of these accurate gauges entailed considerable expense, and we supposed that the orders would be in in hundreds before the makers got their patterns made. It is a sad commentary on the desire of railroad companies to maintain standard sizes, that two months after the notice about the gauges was issued only twelve orders had been received, six from railroad companies and six by car coupler makers. If this apathy about exact measurements continues railroad companies will soon find a variety of so-called M. C. B. standard couplers that will not couple together. A small expenditure now for good gauges will be the means of preventing great inconvenience and expense in future. Those that are making their couplers conform to the standard lines will be compelled, when this type of coupler becomes a little more numerous, to refuse to accept cars having couplers that do not conform to the standard. When railroad companies persist in making their own gauges, they will soon have dimensions that no good mechanic would recognize as the measurements made standard by the Master Car Builders Association.

CHANGES ON THE CHICAGO & EASTERN ILLINOIS.

The rumor of changes to take place in the mechanical department of a railroad whose headquarters are not very far removed from Chicago, recalls a number of changes which have taken place in that department of the same road during the past two years. So many changes have taken place that we would not attempt to enumerate them all without looking over the record carefully, but from memory we can recall a number which may be briefly stated as follows: First, the head of the entire mechanical department resigned and another man was chosen to superintend both locomotive and car departments. Shortly afterward a new car builder was obtained, and the duties of the man already on the ground were limited to the locomotive department. Then both stepped out and were succeeded by a man who took charge of both departments. His powers were afterward curtailed and a new car builder appointed. That car builder resigned and another one took his place. Now the heads of both locomotive and car departments are to leave, and it is rumored that another is to come and assume charge of both departments. There may have been more changes than these, but we cannot recall them at present; but surely this is enough to indicate that an official position in the mechanical department of that road is a precarious affair. We have no means of knowing exactly how the efficiency of the department has fared during these two years, but even with the very best of men occupying these positions for such short times, and with the numerous changes in policy by which the locomotive and car departments were consolidated and separated so many times, it could not possibly have been what it should be. It is only when the changes in any department are few that the greatest efficiency is to be obtained; but often as this truth has been stated, there appear to be many who have never yet learned it or appreciated its force.

The above article without the caption is taken from the *Railway Review*. Every word is true, but it was a mistake not to mention the name of the road, which is the Chicago & Eastern Illinois. A series of serious wrongs has been perpetrated by the manager of this road, and we do not consider it is good journalism to merely hint at the names of those committing injustice of this character. The general manager af the Chicago & Eastern Illinois inaugurated his connection with the road by crowding out a man who was admitted, by all people capable of judging, as being one of the ablest master mechanics in the country. We have been unable to follow all the changes that have taken place in two years, but we are certain that several highly capable mechanical officers have had their reputations imperiled by accepting appointments on the road which self-respect prevented them from retaining. This is the kind of business that comes from the appointment of a callow manager with a head swollen out of balance by contemplation of his own imaginary importance. More changes are urgently wanted on the Chicago & Eastern Illinois, but they ought to begin by the appointment of a new manager.

REFRIGERATOR CARS.

The article to be found in another part of this paper on "Commercial Refrigeration" gives some interesting facts about an industry which is rapidly attaining great magnitude. One department of this industry—the use of refrigerator cars—gives an excellent illustration of the readiness of our countrymen to provide special provisions to satisfy new requirements. Only a few years ago refrigerator cars first were tried as a doubtful experiment. Some far-seeing promoters of this system of carrying meat from the regions of production to the places of consumption persisted in face of all obstacles and their enterprise was forced into success. That success was merely the beginning of the business, for it was readily seen that when dead meat could be carried in good order long distances in refrigerator cars that all other perishable commodities could be transported to market in the same way. Every year adds to the volume of this traffic, and although the business is attended with some drawbacks in the way of losses due to delays in transit, it keeps increasing very rapidly, and the means of rapid transit for cars containing perishable articles are every month becoming better perfected.

The refrigerator car has done much to increase railroad business, but it has done a great deal more for the people who live in great cities and find wholesome food a luxury, pleasure and source of health. The refrigerator car not only brings all kinds of meats to the markets in prime order, but it is making far-away states the fruit gardens and market gardens of great cities thousands of miles away. The semi-tropical countries of Florida, Mexico and Southern California have been the greatest gainers from the use of refrigerator cars. The fine fruit raising districts of these countries were of little value a few years ago, because there was no proper means of transporting the produce to markets. The refrigerator car service developed and wildernesses became gardens. The fruit raisers found themselves growing in wealth and prosperity, and the products of these far-away orange groves, vineyards and gardens was poured upon our cities at fabulously low prices, making a constant demand and creating a new business.

The frequent recurrence of fatal highway crossing accidents is surely bringing upon railroad companies coercive measures for compelling the elevating or depressing of the crossings in crowded localities, and the protecting of the crossings by electric alarms at the places where this measure will secure sefety. This tendency was clearly indicated in an investigation recently made by the New York Railroad Commissioners into an accident that happened at a crossing of the Staten Island Rapid Transit Railroad where three persons were killed and one severely injured. After the investigation the State Board of Railroad Commissioners recommended that the embankment and woods be cut down so as to give a clear view from the crossing of south bound trains; that an electric ball be erected and placed in operation at this crossing, and at all unprotected crossings on the line of the road where there is not a clear view of at least a quarter of a mile. The only mistake made by the Board in this case was that the decision did not apply to all the railroads in the state, and that inspectors were not appointed to ascertain where the numerous crossings needing protection were situated.

The month of November, 1891, ought to be noted in future calendars as being famous for the number of train robberies that were attempted on the railroads of the United States. It ought to be, unless the business of train robbing becomes so easy, safe and lucrative that a robbery every second day will represent a slack period in that line of industry. Railroad companies in most of the States are required to pay heavy taxes presumably that they may enjoy the protection of the law, but the prevailing practice in most States is to leave the railroads to be plundered with impunity by any ruffians who may feel inclined to enrich themselves by train robbing. It is high time that public opinion was stirred up to a realizing sense of the iniquity of train robbing, and that proper laws were enacted to punish and detect this species of crime. As a rule train robbery is accompanied by the most wanton forms of murder. The derailing of a train for the purpose of robbery ought to be made a case for capital punishment whatever may be the result of the attempt.

The old wood burning locomotives, with balloon shaped stacks, are supposed to be relics of bygone days of slow railroading and hand brakes, but within 50 miles of this city one of these engines is doing service on the Delaware, Lackawanna & Western Railroad. The machine is called the "Stanhope," and she works on the ash and working trains on the line in the vicinity of Dover, N. J. When she starts puffing the smoke from the stack darkens the streets about the station, reminding the people of what the country at large used to have to undergo in the days when "woodburners" were regarded as machines that were good enough to keep pace with those slow going times.

The directors of the Great Northern Railway of England are reported to be considering the advisability of abolishing the different classes of cars and of making all the passengers travel in one kind of car as they do in omnibuses. On most of European railways there are first, second and third-class cars, the latter carrying the greater part of the traveling public. Some years ago the Midland Railway of England abolished the second-class, and the new practice has worked well. John Bull is getting to be rather democratic when it is proposed to carry his Grace the Duke and his ownself the chimneysweep cheek by jowl on the same seat. The proposition to do this must cause some affliction to those who have lagged behind in social progress and still maintain that the king and the servant are of different qualities of clay.

The latest news from South Dakota indicates that, notwithstanding assertions to the contrary, none of the railroads of that State has cars enough to transport the grain crop. The warehouses are all full, farmers cannot find storage room, and at nearly all the small towns no grain is bought now. Farmers are obliged to erect temporary sheds. There is no market for corn, nearly all of which is still standiug in the fields unhusked. Cattle shipments are also greatly retarded. Threshing still continues in many parts of the State, and although extra trains are run on all the roads it is thought the grain shipments will continue uninterruptedly until spring.

At the November meeting of the Southwestern Railroad Club held at Atlanta, Ga., Mr. James Meehan, of the Queen & Crescent, submitted a paper on "Uniformity in Locomotive Performance Sheets." The paper discoursed on the methods of collecting data for performance sheets. This is one of the subjects under investigation by the Railway Master Mechanics' Association, and it is expected that the discussions of the various clubs will give the Master Mechanies' Committee valuable information for their report.

Mr. W. H. Thomas introduced a very valuable and seasonable subject for discussion at the last meeting of the Southwestern Railroad Club. His theme was "Repair Work on Large Railroad Systems," and the scope of investigations was: Should the work be conducted in one large establishment supplemented by several small ones, capable of doing repair work only, or should the manufacturing work be conducted in several plants distributed over the system, each capable of doing all kinds of repairs?

An English inventor has designed a modification of our highway crossing electric alarm signal to be used as an alarm for trackmen when a train is approaching. The next improvement on that which is badly needed is something that will alarm an approaching train when the trackmen have got a rail up and no signal out.

All of the fast locomotives that have pulled the celebrated high speed trains on the New York Central have Richardson balanced valves. The engines are noted for their ample steam ports, but these valves show no tendency to cut the large bearing surfaces, even with the exceptionally high steam pressure weighting them down. The engines also have Nathan sight feed lubricators for the valves.

Cy. Warman's beautiful poem, "The Open Switch," has been set to music by Harry B. Iszard and published by D. Field & Co., Denver, Colo. We recommend all our musical friends with railroad sympathies to send for the piece.

Personal.

Mr. John Tonge has been appointed master mechanic of the Minneapolis & St. Louis Ry.

Mr. A. E. Thatcher has been appointed general foreman of the Wabash shops at Delvey, Mich,

Mr. Frank Bruce, master mechanic of the Chicago & Eastern Illinois, is reported to have resigned.

Vice-President Shaughnessy, of the Canadian Pacific, has gone on a business trip to China and Japan.

Mr. Thomas Armitage, foreman of the locomotive shops of the Grand Trunk at London, Ont., died last month.

Mr. James Brady, division master mechanic of the Gulf, Colorado & Santa Fe, at Galveston, has been transferred to Temple, Tex.

Mr. J. C. Twombly has been appointed general superintendent of the Sioux City Elevated Railroad & Rapid Transit Company.

Mr. C. A. McAlpine has been made superintendent of the northern division of the Old Colony, with headquarters at Framingham, Mass.

Mr. A. Rowland has been appointed master car builder of the Western of Alabama and Atlanta & West Point, succeeding Mr. William Apps.

Mr. George Gould has been elected vice-president of the Manhattan Elevated Company, to succeed Mr. R. W. Galloway, who has resigned.

Mr. T. M. Preval, for many years master car builder of the Georgia Railroad, died a month ago. He had been 42 years in the employ of the company.

Messrs. Angus Sinclair and John A. Hill have purchased *The Locomotive Engineer,* and will run it together under the name of *Locomotive Engineering.*

Mr. M. J. Rogers, superintendent of machinery of the Florida Central, has resigned, the climate of Florida having proved too enervating for his constitution.

Mr. James McDonough, traveling engineer of the Gulf Colorado & Santa Fe, has been appointed division master mechanic, with headquarters at Galveston, Tex.

Mr. A. F. Priest has been appointed master mechanic of the St. Joseph & Des Moines divisions of the Chicago, St. Paul & Kansas City, with headquarters at Des Moines, Ia.

Mr. C. W. Risley, superintendent of the Pittsburgh, Akron & Western, whose headquarters have hitherto been at Delphos, has been appointed general superintendent of that road, with headquarters at Akron, O.

Mr. W. H. Whitaker has resigned the position of master mechanic of the Minneapolis & St. Louis. Mr. Whitaker was long general foreman of the repair shops of the company before being made master mechanic.

The position which ex-Superintendent R. W. Baxter, of the Baltimore & Ohio, will hold on the Union Pacific is superintendent of the Oregon division. Mr. Baxter was formerly superintendent of the Wyoming division.

Mr. Thomas Anderson, who recently left the Pittsburgh & Western to become master car builder of the Chicago & Eastern Illinois, has resigned the latter position to return to the Pittsburgh & Western as master car builder.

Engineer C. S. Biehler, who superintended the construction of the new Tacoma repair shops of the Northern Pacific, succeeds Engineer Bedolfe, who has recently resigned as division engineer of the road, with headquarters at Tacoma, Wash.

Mr. John Turner, superintendent of the Louisiana division of the Illinois Central, has resigned. Mr. Turuer began his connection with the Illinois Central over 18 years ago as a train dispatcher, and was soon promoted to be superintendent.

Mr. Frank Charles, of Cedar Rapids, Ia., who was for some time foreman of one of the Texas & Pacific repair shops, had to return home prostrated with malaria. He recently underwent an operation in a New York hospital and is now said to be rapidly regaining his health.

Mr. J. C. Weld, superintendent of the Ultima Thule, Arkadelphia & Mississippi road, was killed in a wreck on the road near Arkadelphia, Ark., Oct. 30. The caboose in which Mr. Weld and several passengers were riding was derailed and thrown down an embankment.

Mr. E. G. Russell, for the last few months superintendent of the Wisconsin division of the Illinois Central, has been promoted to the position of superintendent of transportation of the whole system with headquarters in Chicago. Mr. Russell is a particularly clear headed and energetic officer.

Mr. E. L. Cheneworth, night operator for the Wabash at Bluffs, Ill., has just been acquitted by a jury at Winchester, Ill., on a charge of murder. Mr. Cheneworth killed a man named Thompson, who was endeavoring to enter his office for the avowed purpose of assaulting him. The road bore the expense of the defense.

Mr. James L. Mallette has been appointed master mechanic of the South Bend road. He was for a few years master mechanic of the City & Suburban road at Savannah. He served his apprenticeship in the shops of the Central of Georgia at Savannah, afterward running as a locomotive engineer on that road and the Savannah, Florida & Western.

The suit brought by the Union Pacific against Mr. C. H, McKibben, formerly general purchasing agent of that road after he retired from that position about eighteen months ago, has been dismissed by the company. The suit was brought to recover $60,000 alleged to have been received by Mr. McKibben as bribes from supply companies and on false vouchers.

We have had a call from M. Ernest Chabal, mechanical engineer of the Paris, Lyons & Mediterranean Railway, and two assistants, who are in this country for the purpose of studying American railroads and rolling stock. They have visited the New York Central shops at West Albany, and are now visiting various other railroad shops, locomotive works, rail mills, etc.

It is reported that Mr. C. H. Cory, of the Cincinnati, Hamilton & Dayton, and Mr. W. H. Miller, of the Columbus & Hocking Valley, have both resigned to take the position of superintendent of motive power of the Chicago & Eastern Illinois. We have waited for more nominees for this precarious position, but as we go to press to-night the other names must wait over.

Col. F. K. Hain, general manager of the Manhattan Elevated Railroad, has been elected second vice-president of the company. He will continue to perform the duties of the manager of the operating department of the system. Colonel Hain was first appointed to this company as master mechanic. He was raised on the Reading, took part in the war, and was afterward the mechanical head of several railroads, including the Erie.

Mr. J. S. Turner, formerly chief inspector New York Air Brake Co., has been appointed master mechanic of the third division of the Mexican Central Railroad, with headquarters at Jimulco. Mr. Turner is a graduate of the Altoona shops and served on the Pennsylvania, and later was division master mechanic on the same division of the Mexican Central to which he now returns. The division is 440-miles long. Mr. Turner is a member of the Railway Master Mechanics' Association.

The employés of the Chicago & Northwestern mechanical department have contributed $1,500 for a monument for the late Mr. George W. Tilton, formerly superintendent of motive power of the road. The subscription list was made by the engineers, firemen and mechanics of the workshop. The amount given was limited to $1 each. The monument will be erected in Rose Hill Cemetery, Chicago, and is made of granite, beautifully polished and suitably inscribed.

Mr. Edward Y. Townsend, president of the Cambria Iron Company, died last month. To a great extent through the business ability of Mr. Townsend the Cambria Iron Company rose from a struggling concern to one of the most prosperous establishments in the country. He became a stockholder of the company in 1862, and was elected vice president. He was elected president in 1873. After the disastrous flood in 1889 that swept the works away his energy, liberality and benevolence did much to lighten the distress caused by the calamity.

The many friends of Mr. John Hickey, superintendent of motive power of the Northern Pacific Railroad, will be pained to learn that he has just lost a son, James C. Hickey. Mr. Hickey's son was 18 years and 7 months old. Early last spring he had la grippe and he never recovered. He was attending college at Appleton, Wis., when taken sick, and his class graduated last June. He secured his diploma, although not able to attend school for some time previous to the close of the term. He was exceptionally bright and a universal favorite. His ambition was to enter the University of Minnesota, and had his heath permitted he would probably have been a competitor for the master mechanics' scholarship at Steven's Institute. His death, although not entirely unexpected, was sudden and came with crushing force to his family.—*Railway Age.*

Another railroad club has been organized. On Nov. 17 a number of railroad men met at Fort Worth, Tex., and formed the Texas Railway Club. The officers elected are John F. White, master mechanic Fort Worth & Denver City Railway, president; A. S. Douglass, superintendent motive power Texas & Pacific Railway, vice-president; Thos. A. Kuntz, stenographer mechanical department Fort Worth & Denver, secretary; Robert E. Masters, manager Marshall Car Wheel Company, treasurer. Board of directors: W. P. Siddons, superintendent car department of International & Great Northern, chairman; Wm. O'Herin, general master mechanic Missouri, Kansas & Texas; Thomas Ingalls, master mechanic St. Louis & Southwestern Railway; J. J. Ryan, master mechanic Galveston, Harrisburg & San Antonio Railway; Joseph McGee, master car builder Houston & Texas Central Railway.

What manner of man the late Lawson Valentine, the well-known varnish manufacturer and president of the *Christian Union* Company, was, is well illustrated by a letter written by him in June, 1887, which is published in the *Christian Union.* Houghton Farm, Mr. Valentine's extensive estate at Mountainville, Orange County, is well known. The owner's desire that others should share in his enjoyment of it is forcibly set forth in the letter referred to. Mr. Valentine's correspondent had asked permission to bring some people to visit the farm. In reply Mr. Valentine said: "You and all the men, women and children in Orange County are welcome to range all over the acres of Houghton Farm, and have just as much pleasure as you can possibly get out of it. The farm will be made better by every such excursion, and I should like to have 10,000 people come here between now and the time snow flies.' It may be added that the only restriction placed on visitors by Mr. Valentine was that none should be admitted on Sundays.

Moncure Robinson.

There are now very few of the engineers left who took part in the construction of our first railroads and those who worked on the earlier transportation problems are nearly all gone. A pioneer engineer whose work extends away into the period when the canal was considered the proper means of inland navigation has just passed away in his 90th year. Moncure Robinson, who was born at Richmond, Va., in 1802, begun work as an engineer on the State survey when he was sixteen years old, and his aptitude for the business made him the leader of the work before it was finished. Up to 1825 he was engaged on various engineering enterprises, mostly in Virginia. In that year he made a protracted visit to Europe, and while in England made the acquaintance of George Stephenson, who was then engaged in the construction of the Stockton & Darlington Railway. Mr. Robinson had before this time expressed himself in favor of railroads for inland transportation in preference to canals and he paid great attention to the details of the work Stephenson was doing.

The first work that Mr. Robinson undertook on his return from Europe, in 1827, was the building of the Pottsville & Danville Railroad, which was operated by a system of inclined planes where water power was employed to carry up the empty cars. For two or three years he was engaged in the building of different portage roads. In 1831 he superintended the construction of the Petersburg & Roanoke Railroad, and immediately afterward the Richmond & Petersburg, in connection with which the greatest piece of bridge engineering in this country at that time was done. This was the building of a bridge over the James River, which was 2,844 feet long and 60 feet above the water. The greatest engineering work that Mr. Robinson performed was the building of the Philadelphia & Reading Railroad, which was begun in 1834. The engineering difficulties were very great, but he overcame them with the consummate ability which early in the railroad era gave American engineers world-wide celebrity for their skill in locating railroads through difficult regions. In the construction of the Philadelphia & Reading Mr. Robinson arranged the gradients so that a locomotive should be able to haul up as many empty cars as it could pull loaded ones from the mines to the water front. In 1847 he retired from active work and has resided in Philadelphia since that time.

A post of the Grand Army of the Republic was organized in London, Ont., last month and Mr. J. D. McIlwain was elected commander. Commander McIlwain is assistant mechanical superintendent in charge of the Grand Trunk car shops at London, He is a frequent contributor to the pages of the NATIONAL CAR AND LOCOMOTIVE BUILDER.

Mr. William H. Fenner, Jr., former president of the Allen Paper Car Wheel Company, was last month elected to the presidency of the Grant Locomotive Works, an office made vacant by the resignation of E. T. Jeffery, to become president of the Denver & Rio Grande, with headquarters at Denver. A meeting of the Board of Directors was held in the company's office in the First National Bank building, Chicago, for the purpose of formally accepting Mr. Jeffery's resignation and electing a new president. The members present were W. J. Watson, J. F. Pierson, Morris Sellers, E. G. Keith, W. T. Block, J. H. Wilson and George M. Bogue. Mr. Fenner is well known to nearly all railroad men. He was long general agent of the Rhode Island Locomotive works, which he left on being elected president of the Allen Paper Wheel Company. He has lately been connected with the Otis Steel Works. In all the positions he has held, Mr. Fenner has been noted as a particularly successful salesman.

Communications.

Safety of Chilled Car Wheels.

Editor National Car and Locomotive Builder:

Another case of looking backward was my mental reflection on reading the letter on Safety of Chilled Car Wheels by P. H. Griffin which appeared in your last paper. The writer of that letter is directly interested in trying to keep up the reputation of cast iron wheels and he does his best to make out a defense of an article that has fallen into disrepute; but his letter will not make railroad men forget the experience they have gone through with cast iron wheels. We are all willing to admit that there are good and bad cast iron wheels and those who have given the subject the most disinterested consideration are forced to the conclusion that the best chilled wheel is not good enough for running under passenger cars. The fact that the Pennsylvania Railroad uses cast iron wheels under its passenger cars and that Mr. Ely, superintendent of motive power, testified to the Massachussetts Railroad Commission that cast iron wheels are less liable to breakage than steel tired wheels merely proves the position taken by the railroad company named, which in this case is different from other railroad companies having the safety of their passengers at heart. The discomfort of the Pennsylvania Railroad passenger cars with the constant rumble of the cast iron wheels is notorious and loses the company many passengers, but the corporation is so much dominated with narrow prejudices that the loss of business is lost sight of and the risk of loss of life from breakage of wheels persisted in.

The car wheels made by Mr. Griffin may have special strength and excellence, but that will not obliterate the suspicious reputation obtained by chilled wheels generally, for men deciding on using wheels must deal with the average. We are all anxious to keep down the cost of our equipment, but we cannot afford to take the risks that using the average chilled wheel under passenger cars entails. Most of chilled wheel makers are ready to offer us wheels at the prices we pay for brake shoes, and we know from bitter experience that many of the wheels are dangerous to use. Under these circumstances, a man having the responsibilities of safe train movement properly in his mind will choose a steel tired wheel even where its use is more costly than cast iron. There are no doubt poor steel tired wheels, but it is easier detecting defects in them then it is with chilled wheels. A chilled wheel generally looks all right till it breaks. Accidents in such a case cannot be prevented by care and watchfulness. When a steel tired wheel shows signs of weakness they are nearly always of a character that will admit of long mileage without imminent danger.

The railroad car builders who use steel tired wheels under their passenger cars will no doubt be duly thankful to Mr. Griffin for telling them about their bad management of their business, but they will endure his disapprobation better than that of their general manager should he have the work to do of figuring up the cost of a wreck due to the breaking of a cast iron wheel under a passenger car. The railroad companies of this country did not abandon the chilled wheel for one that was more expensive merely as a whim. They were compelled to do it by force of public opinion, and the failure of cast iron wheels stirred up the press and the public to demand the use of a safer wheel. I feel certain that I could reduce the expenses of my department considerably by using cast iron wheels under passenger cars, but like many others I dare not try it owing to the evil reputation which cast iron wheels have with the authorities watching over railroads.

In scolding railroad men for being prejudiced against chilled wheels, Mr. Griffin is barking up the wrong tree. He ought to turn his growling powers upon his fellow wheel makers, who have made wheels to sell and not to wear. Not the railroad companies or their officers have been the arch enemies of the chilled wheel. The wheel makers have vied with each other in making chilled wheels of a quality that frightened from them the men most warmly inclined to use that kind of wheel. When a change of practice regains the confidence of the public, when its exemption from breakage leads railroad commissioners and others to advocate the use of the cast iron wheel, then shall I return to what was my first love.

M. C. B.

Editor National Car and Locomotive Builder:

I beg the privilege of your columns to make a few comments on Mr. Griffin's communication entitled "Safety of Chilled Car Wheels."

I wish to ask, first, whether he bases the assertion that "in proportion to the number in use the breakages of steel wheels far exceed those of chilled wheels" upon theory or fact, and, if from statistics, where he obtains them?

One fact upsets a dozen theories. Is it not a fact that chilled wheels fail in various ways, by the thousands annually, by which trains are imperiled? This fact is obvious to the wayfarer—of an observing turn of mind—in his visits to the various railroad shops of the country, where at almost every shop yard can be seen hundreds of them.

Do not the records of accidents to freight trains demonstrate this matter beyond question? Of course, "it's the other fellow's wheel which fails, not ours." The attitude assumed on this question is very suggestive of the property-owner in a malarial and mosquito infested section, it's the neighboring town that's so affected, and his protest as to exemption from these afflictions is gauged or measured by the amount of real estate he may own,

Referring to the statement that the Pennsylvania Railroad uses chilled wheels under all their equipment, permit me to dispute this statement and follow it by another, that the road in question has *steel* tired wheels under the leading trucks of nearly all passenger engines, under a great number of tenders, and under all of their chair, parlor and private cars, and are buying them by the thousand annually.

Whether the incentive is a want of faith in cast wheels or a compliance with the demands of the public sentiment, I will not venture to state.

I wish to ask Mr. Griffin another question. What paper published the statement in reference to breakages of steel tires in the German Empire? Was it steel tires or steel tired wheels, and who is the authority for the statement? I dispute the statement, and ask for the evidence.

But granting it is so, we must remember the fact that every wheel in all Europe is steel tired, and the percentage of breakages might then fall way below cast wheel breakages in this country; and still another very important fact, Bessemer steel was used, not open hearth. If cast metal for a wheel is equivalent in safety and wear to steel, then why use a steel tired driving wheel? Why not cast them complete and chill the tread and flange? It would save a dividend annually to all roads in first cost, and there ought to be no difficulty whatever in convincing the average superintendent of motive power of the increased safety and economy, if Mr. Griffin is correct.

I await anxiously a reply to this query. Is it an open question with the mechanical world as to the relative toughness of cast iron and steel? Will sledge hammer blows in all directions upon the tread and flange of a perfect cast iron or steel tired wheel produce the same results? Are the flaws inherent to both cast iron and steel tires—I frankly admit steel has some—as discernible in cast iron as in steel? And when these flaws do exist in a cast iron wheel, is it not invariably made known by the summons, "All hands wanted at the wreck?" The cast wheel causing an accident on an eastern roads two years since, resulting in the death of 30 persons and the wounding of 50, costing the company over $400,000, compelling them to pass their dividend for that year, the first in some 10 or 15 years, was inspected only 40 minutes previous to the awful accident and pronounced all right. If a flaw existed at the time of inspection, will Mr. Griffin kindly describe its probable lines and character? Was this not a $12 wheel?

Flaws in steel tires almost invariably start and grow so gradually that months will elapse before they assert themselves, eliminating all danger by the most ordinary inspection.

Finally, I wish to say that this question of steel tired wheels versus cast iron is becoming intensely personal to every traveler, and the public are becoming so intelligent that they can and do discriminate between the two and throw their patronage in favor of steel tired wheels, which is unquestionably the sensible thing to do. No management can afforn to assume the responsibility for accidents resulting in the loss of life as a result of a broken cast iron wheel. The day has passed for this. The legitimate field for them is in the freight service, and it is selfish presumption, in the light that we have at this day, to attempt to force them back in passenger service. Life is too sacred to be thus imperiled.

F. W. COOLBAUGH.

Opposed to Fast Trains.

Editor National Car and Locomotive Builder:

In your November number I notice a paper read before the Railway Superintendents' Association on "Economy in Train Service."

If some of the suggestions made therein were, in the main, carried out in practice we would have some different railroading than obtains at present; but while it is easy to suggest good measures, it is not always so easy to get them adopted, for various reasons.

The first principle certainly should be safety to life and limb, and safety to property; then rapid transit should receive due consideration. The tendency at present is to ward more rapid transit as regards passenger and freight, particularly the former, and, so far as the commercial principle is involved, I do not yet see how rapid passenger traffic can benefit the companies, for if one line decreased the time of a passenger train the competing lines immediately follow, and the patronage remains about as before, while the expense of handling the volume of travel increases, both on account of the wear of equipment and permanent way and the increase of risks; besides, the difficulties of operating are increased and the margin of safety decreased. Good tracks, ample sidings, terminal facilities, good locomotives, rolling stock, telegraph lines, etc., are, indeed, necessary and desirable: but do we always find those things of the best, and if not, why not, since they are so necessary to success and economy Does not the question of present profits come in here? and as all stockholders are not practical railroad men, nor all officers, for that matter, many devices and makeshifts are put in service to serve the present, at least, and if disasters follow, those people will put the blame on something that will be the least likely to disclose their methods.

"To run trains on time is the first consideration; schedules should not be faster than can be made regularly." True, running on time is the great desideratum, and while it is certainly desirable to make good time, schedules should not be faster than safety permits. But right here comes the difficulty—shall we say danger—for roads that have not got all safety appliances and best equipments, etc., attempt to compete with those that have.

As regards local passenger train service that is not competing there is certainly little excuse for making schedules that cannot be made pretty regularly, but often the time given a train may be sufficient for the entire distance, but so divided up that it is difficult or impossible to complete the trip on time. A little more consulting or advising with train crews, particularly engineers, would often result in getting up schedules more easy to make. Officials, however, usually think it only necessary to state the time a train is expected to start and terminate a run, then leave the dividing up of the running time to some subordinate that perhaps knows little or nothing as regards the requirements or conditions. To run extras on special time tables, as a rule, would prove quite impracticable and confusing, except in an emergency and only in case of a passenger or high class freight. "Great care should be exercised in the selection of conductors and trainmen. Qualities to meet and deal with the public in a pleasing manner are essential, aud when such qualities are lacking priority of service should be ignored." Quite so; but in railway service it is hardly necessary that an employé should be a veritable Chesterfield to deal with the public any more than if employed in any other occupation. Civil and gentlemanly qualities are essential, certainly, at all times, both in the relations of employés and officials and in their relations to the general public; as regards the ignoring of priority of service, any man that would prove himself ungentlemanly to the patrons of the road should certainly have his attention directed to his failing, and if no improvement was forthcoming he should be dismissed for incompetency.

As regards the running of crews first in first out, it is desirable to keep engineer, conductor and crew together as much as possible and particularly is this very necessary on way freight trains as the men get to understand each other and can pull along better, make better time, etc., but in ordinary through freight service it is quite impossible and unsatisfactory to the men to keep crews and engines together,and the best that can be done is to select the new conductors and engineers with care, and know that they are thoroughly instructed in their duties before instrusting them with grave responsibilities. The assertion is truly made that one of the most prolific causes of accident is the frequent changes of men, and this can as often be charged to incompetency on the part of the superintendent as on that of the men. The arbitrary rule of some little railway Czar often proves baneful to the best interests of the company that employs him; he has no clear conception of the necessary attributes of a good subordinate, nor has he a thorough familiarity with the difficulties that beset traffic operation, and, as a rule, he will use undue severity in dealing with misdemeanors, and often will deprive the service of a well trained and reliable man who very probably would run successfully a long time without another mishap, while in his place the man promoted, or hired into the service, is an experiment.

The man brought up on the road and carefully educated in its methods is all right provided the methods are good.

J. J. CLAIR.

East Tennessee Compound Locomotives.

So many elements of uncertainty interfere in making tests of locomotives, that there is a disposition among railroad men to doubt the figures from trials made during a few runs. For this reason there are still many doubting Thomases on the performance of compound locomotives. Most men will believe the records of the mileage sheets when they extend over months. For this reason the recent annual report of General Manager Hudson of the East Tennessee, Virginia & Georgia will be considered of great value as testimony about compound locomotives. The following is a slightly abridged copy of Mr. Hudson's report. The locomotives were built at Schenectady and are of the two-cylinder type.

"Early last year we received three compound engines, one a 10-wheel passenger engine, the other two consolidation freight engines. There were built at the same time two 10-wheel passenger engines similar in all respects except with the ordinary single expansion cylinders, and a number of consolidations exactly like the compound excepting with the single expansion cylinders. The three passenger engines were put into service at the same time—about Sept. 1—between Bristol and Knoxville. The grades here are 69 ft. to the mile, with a very large amount of 6 and 8 deg. curves. The engines were run following one another around in the trains, sometimes having the heaviest and sometimes the lightest trains. This was con-

tinued during the ten succeeding months of the year, and the results are shown below. The tests are the more valuable because the engines were of the same build, age and in every respect similar. The statement below shows a saving of 25.56 per cent. in fuel:

	Miles run.	Car miles.	Av. cars per train.	Lbs. coal consumed.	Lbs. coal per car mile.
2 simple engines..	107.895	564,995	5.23	6,263,654	11.086
1 compound engine.....	49,100	254,204	5.17	2,097,911	8.255

Saving pounds of coal per car mile..... ..... 2.834
" " " ....25.56 per cent.

"The two compound consolidation engines were put into service Aug. 1, and until Jan. 31, 1891, they were upon the line between Bristol and Knoxville, the same covered by the passenger engines. The engines took their turns in the runs, changing their engineers; getting sometimes heavy and sometimes light trains. After Feb. 1 they were put upon the road between Knoxville and Chattanooga, where the grades are a little lighter, but they were run in the same way five months, following other engines around. The use of the compounds was in a measure experimental, and during the first few months several slight changes were made which improved their working. The statement below shows a comparison of the compounds compared with four engines of exactly the same type and build in every way, the same conditions as to flues, etc., for six months, upon the east end of the road, and four other engines of the same style, build, and under the same conditions, for five months, on the west end of the road.

[The statement referred to shows that the simple engines pulled trains averaging 17.73 cars and that the trains hauled by the compounds average 20.38 cars. This work was done with a saving of 24.7 per cent. of coal on the part of the compound locomotives.]

"The compounds have been found equally powerful with the simple engines, no more expensive in the way of repairs. A number of experimental trips, upon which the coal was weighed, water measured, etc., show a slightly greater percentage of saving of both fuel and water. It is believed, however, that the actual service of the engines far one year is a much more valuable test than any single experimental trip. The compound principle has proved itself valuable, and it is recommended that road engines purchased in the future be of the compound type."

Webb's New Compound Locomotives.

Our British contemporaries have lately had a great deal to say about a new compound locomotive lately built at Crewe, under the direction of Mr. F.W. Webb, locomotive superintendent for the Scotch express trains.

We abstract the following description of the engine from *Engineering* :

In the general principle of its design the "Greater Britain" is identical with Mr. Webb's other compounds, that is to say, it has two independent driving axles, one driven by a pair of high pressure cylinders, placed outside, and the other by a single low pressure cylinder, placed inside the frames, the diameters of the high and low pressure cylinders being 15 inches and 30 inches respecspectively, and the stroke in each case 24 inches.

As far as tractive power is concerned the engine is thus practically equivalent to a non-compound locomotive having a pair of 21-inch cylinders with 2-foot stroke. The driving wheels are 7 feet 1 inch in diameter.

The "Greater Britain" is eight-wheeled, the leading wheels being fitted with Mr. Webb's arrangement of radial axle box, while the trailing wheels have a lateral play of ½ inch. The leading and trailing wheels are both 4 feet 1½ inches in diameter.

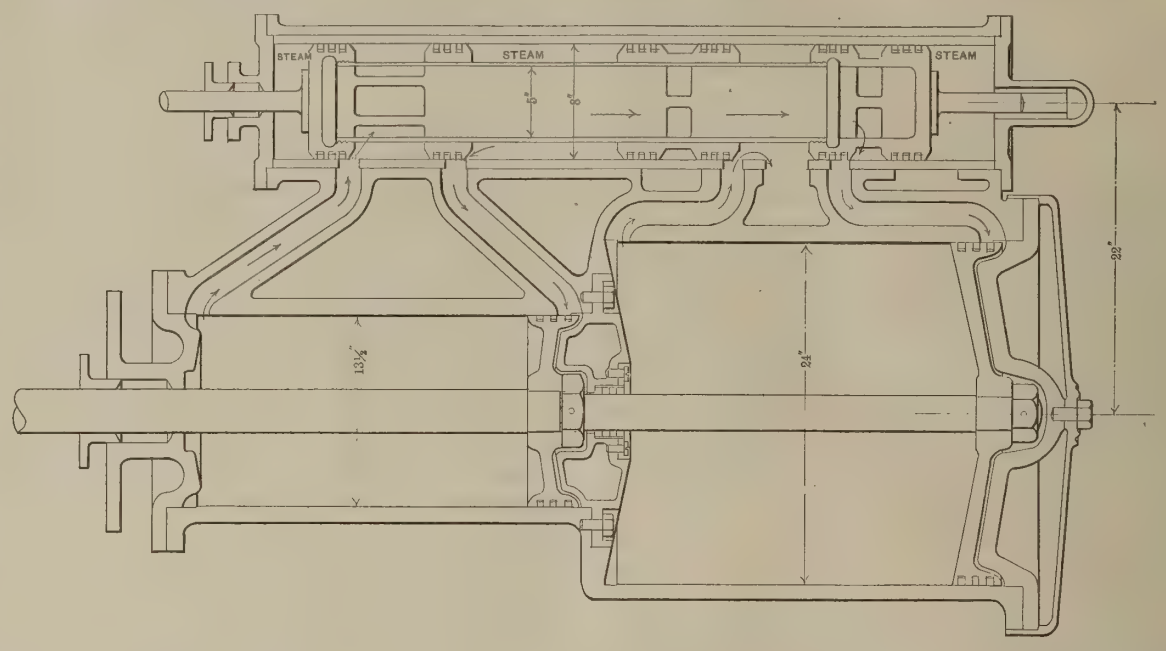
Unlike Mr. Webb's former compounds, the high pressure cylinders are not fitted with Joy's valve gear, but with the ordinary curved link, the valve gear being arranged inside the frames. For the low pressure cylinder Mr. Webb's single eccentric motion, used on all the recent London & Northwestern compounds, is employed. A special feature of the "Greater Britain" is the design of the boiler, which has been made with a very large barrel to allow of both the driving axles being placed under it. The tubes, however, are divided into two lengths by a combustion chamber, those extending from the firebox to the combustion chamber being 5 feet 10 inches long between the tube plates.

The combustion chamber has an opening at the bottom large enough to give ready access to the tubes when required, and this opening is filled with a hopper having a valve for the discharge of ashes. This valve can be operated from the footplate, it being retained in its normal closed position by a balance weight.

Experience in the manufacture of steam hammers has demonstrated that too great rigidity interfered with the durability of the machine, and that every attempt to eliminate elasticity or cushion led to breakage of frames. The same line of weakness led to the abandoning of the use of stone blocks for supporting rails. A highly rigid roadbed, even when the material used is broken stone, greatly increases the wear of rolling stock running gear. In steam hammer building judicious elasticity was settled upon as the most useful, and all the best steam hammers are now built with this principle kept in view.

Canfield's Compound Engine.

The question of the best arrangement of cylinders for compound locomotives is still to some extent an open question. The two-cylinder type appears to be the favorite among our railroad men, but many of those who have given the subject most attention are inclined to think that with increase of sizes the large cylinder of a two-cylinder compound will be too large for the high piston speed that is necessary at times for all locomotives. For those looking



to the four-cylinder type we are pleased to submit the design shown in the annexed engravings which was prepared by Mr. Robart Canfield, master mechanic of the Pennsylvania floating equipment at Hoboken, N. J. A compound engine of this design is in use on one of the tugboats belonging to the Pennsylvania Railroad Company, and works remarkably well. It will be noticed that the cylinders are arranged tandem fashion, with the low pressure cylinder in front; that the two pistons are secured on one rod and that a single valve distributes the steam to both cylinders. The exhaust from the high pressure cylinder passes through the port into the steam chest, then directly through the valve and to the upper port on to the low pressure cylinder. The arrangement of cylinders and valve is well adapted for high speed engines and ought to make a success on a locomotive.

Leave the Door Open for Improvement.

But just as we every week hear of trials of armor plate and guns, upon which the experts of the world have been devoting time and attention for years, but which they have not yet developed into the state of perfection, so the M. C. B. type of coupler is still in a state of evolution and has not reached perfection. This perfection is dependent upon design and material and is lacking in the fact that there is still danger of breakage when it comes in contact with the link and pin. No one is prepared to say that it perfectly fulfills all the requirements that it is desirable that it should fulfill. Still when we ask it of the type we answer "yes," of the details "no." There is only one class of men who are perfectly satisfied, and they are the inventors. Hence any legislation enforcing the adoption would result in the use of something incomplete and not altogether desirable. You may compel the railroads to use the best that there is, but it will be defective and it is not right to unduly hasten the work, but the process of evolution should be allowed to work itself out and go on within the contour lines. Suppose that years ago there had been a legislative enactment enforcing the universal use of the Creamer brake. It was the best we had and the best we knew of, but when the air came it was so far superior to the Creamer that they were all taken off and thrown away. So it should be free to be with the coupler. Legislation should take the form of recommendations like the enactments of the British board of trade; it should provide for publicity, for recommendations, for acting as a sort of recording angel on the acts of railroad managers, and depend on practical developments for the rest. It should investigate accidents, report on their causes, recommend appliances and then leave to the Interstate Commerce Commission to suggest what more authority they may need.—M. N. FORNEY, *Before Railroad Commissioners.*

A cylindrical steel car owned by B. A. Atkinson & Co. is being exhibited in Boston. The body of the car is a cylinder formed of steel plates riveted on 12 ribs of quarter iron, set 4 feet 9½ inches apart, and bent to conform to the shape of the car. The sides are almost entirely occupied by a dozen very wide windows, which, being perpendicular, stand out from the curving sides of the car several inches at the top of the window. These and the monitor roof, which is separate from the body of the car, somewhat relieve its cylindrical appearance on the exterior. The trucks are Jewett four-wheelers, and two heating boxes are hung under the car. The platforms are double, with heavy springs to take up the force of any collision.

Chicago Notes.

Mr. H. Wahlert, formerly superintendent of the American Break Company at St. Louis, has made an engagement with the Radial Drill Company at Cincinnati.

The Southern and Pacific Refrigerator Car Company have made a contract with the Schoenhoefen Brewing Company to build 100 of their patent refrigerator cars.

The monthly meeting of the Western Railway Club was held Tuesday, Nov. 17. The attendance was not as large as usual. The subject under discussion was Boiler Compounds.

The results of exhibit of the Erie Car Heating Company's appliance in operation at the exposition are very satisfactory to Mr. John Voohees, the Western agent of the company, as he reports several orders since the exposition closed.

At the office of the Cushion Car Wheel Company, in club room 9, Grand Pacific Hotel, Mr. Leach has on exhibition a wheel of his patent that he regards as tenderly and lovingly as a mother does her first-born. This wheel is one of eight that have been tested on the I., D. & W. R. R., having been placed on passenger cars in local service. After running 60,000 miles, they were removed, and a thorough examination fails to show a particle of wear on the cushion, and all parts in perfect repair, with only $\frac{3}{32}$ of an inch wear on the tire. A complete and illustrated description was given in the July issue of the NATIONAL CAR AND LOCOMOTIVE BUILDER of this wheel. The company has a very strong letter of indorsement from Mr. John McKenna, master mechanic of the I., D. & W.R.R.

One of the many things that railroads have to contend with is the moving of heavy freight trains from main lines to side tracks, and considerable attention and study has been given the problem by railway officials, without arriving at any definite conclusion as to a device to do away with the trouble. Patents have been granted to Mr. C. E. Nolan, of Battle Creek, Mich., for a safety switch, a model of which is on exhibition in club room, 9 Grand Pacific Hotel. The device consists of cables, one connected with end bar that operates the switch and the other to the locking lever. These cables are attached to wheels that have one-fifth of a revolution. Side levers are attached to the guard, and the guard spiked to the ties. There are also levers on each side of the tenders, operated by the fireman, which lower a shaft four inches. At the end of the shaft is a roller. When this shaft is lowered the roller strikes the guard, depressing it, and causing the wheel to turn one-fifth of a revolution, and throws the switch three hundred feet ahead of the train. Should a switch be left open, the engineer can throw it, even if the train is running at the rate of 60 miles an hour, Mr. Nolan claims, without the slightest injury to the machinery. The switch may be worked in the same manner as an ordinary hand switch if desired.

The Baldwin Locomotive Works of Philadelphia has recently completed for the freight service of the Erie Railway what is the largest compound locomotive in the world. The weight of the engine is 135,000 pounds, exclusive of the tender. It has three pairs of driving-wheels 62 inches in diameter. The weight on these wheels, which is, in a properly constructed locomotive, the measure of the power of the locomotive, is 107,000 pounds. Its length is 56 feet. It is claimed that this engine can be run at a saving of from 30 to 40 per cent. over the same size single expansion engine. Several compounds are under construction at the Baldwin works for the same company, heavier than the one noted.

A Palatial Station.

The Philadelphia & Reading have now about the most inferior station accommodation in Philadelphia that any great railroad has in any large city, and preparations are in progress which will build for the company one of the handsomest and one of the most commodious station buildings in the world. The Reading Railroad, when the improvements under way are finished, will pass through Philadelphia as an elevated railroad, and the new station will also be above the streets. In its exterior appearance the station is said to be a wide departure from anything heretofore attempted, the traditions of railway architecture having been discarded and a magnificent design in the late Italian Renaissance adopted. The building will more resemble a magnificent opera house or public library than a railway station, the design being to combine beauty with utility in a manner that will make the structure one of the greatest adornments of Philadelphia.

The building is eight stories high, the first four stories being of pink granite and the other of light brick and terra cotta, the combination producing a striking effect, somewhat resembling the Metropolitan Opera House in New York, only the structure under notice will be larger and more imposing, forming one of the most beautiful public buildings in the country. While the exterior has been arranged to secure the best architectural effects, the interior has been designed for the comfort and convenience of the patrons of the road.

The main building has 266 feet frontage on Market street, and is 100 feet deep, and is 132 feet high from pavement to top of cornice. The sheds extend to Arch street, and under them from Filbert street north will be the new market house. Work on this part of the structure has been rapidly progressing night and day for some time.

During the winter it will be ready for occupancy, and all the stalls in the present market houses will be transferred to the new structure. Work on the main building will then be pushed speedily, and it is expected that trains will be running into the station next September, although the structure will not be entirely completed until some months later.

The structure is the design of President McLeod. Although competent architects have been employed, he has directed them in every detail, and change after change has been made at his suggestion, until the present design has been reached. It has been his object to get the greatest utility and the most desirable architectural effects with a minimum expenditure, and to make the structure not only an ornament to Philadelphia, but a monument marking the dividing line between the Reading of the past and the Reading of the future.

B., C. R. & N. Rolling Stock.

A letter from Cedar Rapids, Ia., informs us that the shops of the Burlington, Cedar Rapids & Northern are very busy, the business of the road being heavier than it has ever been known. They have just got ten new locomotives into service, but the increased capacity for moving trains is hardly felt in the quantity of produce offered for shipment. Nearly all the locomotives belonging to the road are now equipped with air brakes. They are also applying air brakes to their cars and the M. C. B. standard coupler. There is no more progressive railroad than this in the West, and the low cost of operating shows that keeping the equipment in good order is a paying kind of enterprise. The road has now been running some twenty-three years, and part of the rolling stock first received is old, but it has been so well kept up that there is no worn out car or locomotive belonging to the company.

The policy that has been followed in regard to locomotives is well worthy of imitation by other roads. Many of the engines bought up to within seven or eight years ago were badly over-cylindered, but otherwise they were good engines. Although some of them are too light for main line service there is plenty of light branch work for them to do and they have been kept up so that the work to be done might be performed economically.

There was a group of small Hinkley engines, with cylinders 15 × 22, that were admirable engines for light work, but all of them had wretchedly small boilers. These boilers began to give out six or seven years ago and they have been gradually replaced with boilers from larger engines that also were over-cylindered, and new boilers were purchased to make the larger engines properly proportioned as to weight and to the steaming capacity. The effect of this policy has been that the locomotives are much more durable in service and they do the work with little fuel. One of these re-proportioned locomotives has lately made 107,000 miles before going into the shop and another one is running on passenger service with a mileage of 110,000 and is still in good condition. This performance is done, it must be remembered, on a road where locomotives seldom make more than 50,000 miles before they must be taken out of service to have their flues removed.

There was something interesting about the Hinkley engines that this company got over 20 years ago. At that time there was little or nothing heard about interchangeability of parts which eight or ten years afterward became greatly advocated among locomotive builders; yet these old Hinkley engines were the only locomotives the writer has ever found that had really interchangeable parts. Until they became worn so that the parts were not of the same size, it was a common thing to take eccentric straps, hangers of all kinds, links, rods, etc., from engines in the back shop and use them for running engines that had sustained breakage. There was seldom any fitting to do in changing the parts. It is sad to reflect that with all the pretensions as to interchangeability in these days few new locomotives can be found that have the parts named so nearly uniform that they can be used without considerable fitting.

Mr. R. W. Bushnell, general master mechanic of the Burlington, Cedar Rapids & Northern, deserves credit for the fine condition of the rolling stock. In the work to be done he has followed a broad sensible policy founded on sound engineering principles, and he has displayed good judgment in keeping able assistants. Our correspondent, Mr. William Voss, is in charge of the car department, and he has no superior in shop management and in scheming improvements on cars that increase the service with small expense. Mr. Allan McDuff, the general foreman, is a host in himself, and no man is more successful in taking in a locomotive that appears fit only for the scrap heap and turning it out at small expense with a new lease of usefulness and economical service. These two leaders are well supported by James Lawler, foreman blacksmith; Sam Moses, foreman boiler maker; Sam Maddox, roundhouse foreman, and the foreman painter.

An Engineer Interviewing Bengal Tigers.

A reporter of the New York *Sun* lately interviewed our friend Mr. W. W. Thompson, well known for years back as road foreman of engines of the Manhattan Elevated Railroad, and obtained reminiscences of his experiences in India, where he was a locomotive engineer for some years shortly after the mutiny. The following thrilling adventure was related:

"I saw tigers in plenty in those days," he said, "and every once in a while one of our fellows would be missing. The jungles are not fine country, I can tell you. The snakes were the meanest things we struck. There were little green fellows hidden in the grass, which was so much like them in color you could not distinguish them. Their bite was deadly, though they weren't any bigger than your hand.

"I had one experience with tigers that I will never forget. I was stoping in a bungalow just outside of a jungle. There was a noted tiger hunter with me, and he had come home one night with two little cubs he had captured alive in the jungle. The young ones made a good deal of noise with their whining, and the mother heard them. My friend said he rather expected her around, and suggested that if we climbed on the roof and left the bungalow door open the mother would come right up to us. I wasn't very anxious for her company, but still I didn't want to say anything, so I followed his advice. Pretty soon I heard the most blood-curdling cries that ever filled my ears. They made my heart jump, I can tell you, and shortly two enormous tigers came stalking out of the jungle directly toward us. They looked almost as tall as the bungalow, and I felt that they could jump up to us as easily as winking. Their eyes shone, and I felt a little sick as I thought of what was probably coming. But my friend did not seem a bit frightened. He waited till they came pretty close, then up went his gun to his shoulder and down they went, one after the other. He put a bullet into the brain of each, and that was the last of . Still, one such experience is enough."

Railroad Sociability.

(Burdette.)

"Speaking about the sociability of railroad traveling," said the man with the crutches and a watch pocket over his eye, "I never got so well acquainted with the passengers on a train as I did the other day on the Milwaukee & St. Paul Railroad. We were going at the rate of about 30 miles an hour, and another train from the other direction telescoped us. We were all thrown into each other's society, and brought into immediate social contact, so to speak.

"I went over and sat in the lap of a corpulent lady from Manitoba, and a girl from Chicago jumped over nine seats and sat down on the plug hat of a preacher from La Crosse with so much timid, girlish enthusiasm that it shoved his hat clear down over his shoulders.

"Everybody seemed to lay aside the usual cool reserve of strangers, and we made ourselves entirely at home.

"A shy young man with an an emaciated oilcloth valise left his seat and went over and sat down in a lunch basket where a bridal couple seemed to be wrestling with their first picnic. Do you suppose that reticent young man would have done such a thing on ordinary occasions? Do you think if he had been at a celebration at home that he would have risen impetuously and gone where those people were eating by themselves and sat down in the cranberry jelly of a total stranger?

"I should rather think not.

"Why, one young man who probably at home led the class meeting, and who was as dignified as Roscoe Conkling's father, was eating a piece of custard pie when we met the other train, and he left his own seat and went over to the front end of the car and stabbed that piece of custard pie into the ear of a beautiful widow from Iowa.

"People traveling somehow forget the austerity of their home lives and form acquaintances that sometimes last through life."

The Erie Car Heating Company have had an exhibit of their car heating device at the Chicago Exposition. Mr. John Vorhees, the agent of the company, has shown the heater in operation to a number of railway officials and is seemingly very much pleased with the result.

The National Lock Washer is now being used extensively on car work and on locomotives. The makers have lately received large orders for this class of work. Where this washer is employed it obviates the necessity for jam nuts, and the fastening is secure enough to resist the worst vibration.

The Lee Composite Manufacturing Company, 29 Broadway, New York, report a steadily increasing demand for their products. Among the roads using their "Slagphalt" paint on passenger car roofs are the N. Y., S. & W., N. Y., Ont. & W., D. & H., South Carolina B. & A., P. & R. Staten Island, Rapid Transit, N. Y., Prov. & Boston, and others.

"Slagphalt" prevents cinders from locomotives from cutting the tin, and protects it from the action of acids. Coaches next the engine so treated, after many months' service, it is claimed, show absolutely no evidence of attack from "cinder blasts."

The Falls Hollow Stay Bolt Co., of Cuyahoga Falls O., manufacturers of Mandrel Rolled Hollow Staybolt Iron, report that their trade is rapidly increasing and they are prepared to fill orders for any size and that they will guarantee every bar to give the best satisfaction.

The well known firm of C. H. Boaz & Co., of Cincinnati, O. (formerly Boaz & Maxwell), dealers in railway supplies have sold their stock and good will of their business to Messrs. E. A. Kinsey & Co., of Cincinnati, who have opened a very large store on Fourth Street, with a supply of machinery and general railroad supplies.

Infringing Consolidated Patents.

Editor National Car and Locomotive Builder:

The success of the appliances of the Consolidated Car-Heating Company has been so great that several manufacturers of more of less reputation have not hesitated to pirate our inventions. The Consolidated Company desires to warn railroad companies of these infringements, and thus to acquit itself of the obligation to give such notice. A flagrant violation of the Sewall coupler patents at the present time is especially noticed where all the essential features are appropriated, or closely imitated, while the unsuccessful attempt is made to evade the patents. The imitation is complicated and defective.

Another conspicuous instance is the placing of steam drums upon the cross-over pipes which violates the well-protected invention of the Consolidated Company.

This company will prosecute all such infringers of its patents and all those who use such infringements, while assuring railway companies of its indisposition to trouble them in such matters any more than is absolutely necessary for proper selfprotectio n.

CONSOLIDATED CAR-HEATING COMPANY,
By William G. Rice, Vice-President.

Car Heating Patents.

Editor National Car and Locomotive Builder:

Our attention has been drawn to a communication to the railroad press wherein the charge is made that a recently introduced coupler is an infringement of the Sewell patents. As the new coupler which we are introducing is the only one on the market that will couple with the Sewell coupler, the communication referred to may lead some people who are not familiar with the facts to think that our new coupler may be an infringement of the Sewell patents. The fact is that the Sewell patents are very limited and cover only certain details of construction that are peculiar to the Sewell coupler, but which are not at all used in our new coupler. We have competent legal advice that Gold's Universal Straight-port Coupling does not infringe either the Sewell patent nor any other coupler patents; and we guarantee all railways adopting our new coupler immunity from loss or inconvenience by reason of any claims of infringement. Owners of any patents alleged to be infringed should proceed against us instead of seeking to intimidate our customers. If any railroads using our couplers are sued for infringement (as is unlikely to occur, since no valid claim of infringement can be made) we will defend all such suits at our own expense. Our Universal Coupler is the simplest straight-port coupling made, containing several ingenious and desirable improvements, all of which are thoroughly protected by patents granted, allowed and pending.

We believe it to be the straight-port coupling of the future.

We would further inform the public that the litigation which has been carried on in the Patent Office for the last four years to determine the question of priority of invention of combined steam and stove heaters for railway cars has just been decided by the Appellate Board by the award of the patent containing broad claims to this system to Henry R. Towne and a more limited patent to James F. McElroy. As we have secured licensesfrom the companies owning both these patents we are prepared to continue the manufacture and sale of Gold Duplex Double Coil Heaters and all other forms of heating apparatus which we have heretofore manufactured. Our Duplex Double Coil Heaters are the best and most economical apparatus for heating cars either by steam from the locomotive, or when the car is disconnected, by a fire in the heater.

GOLD CAR HEATING CO.

Brill's Pivotal Truck.

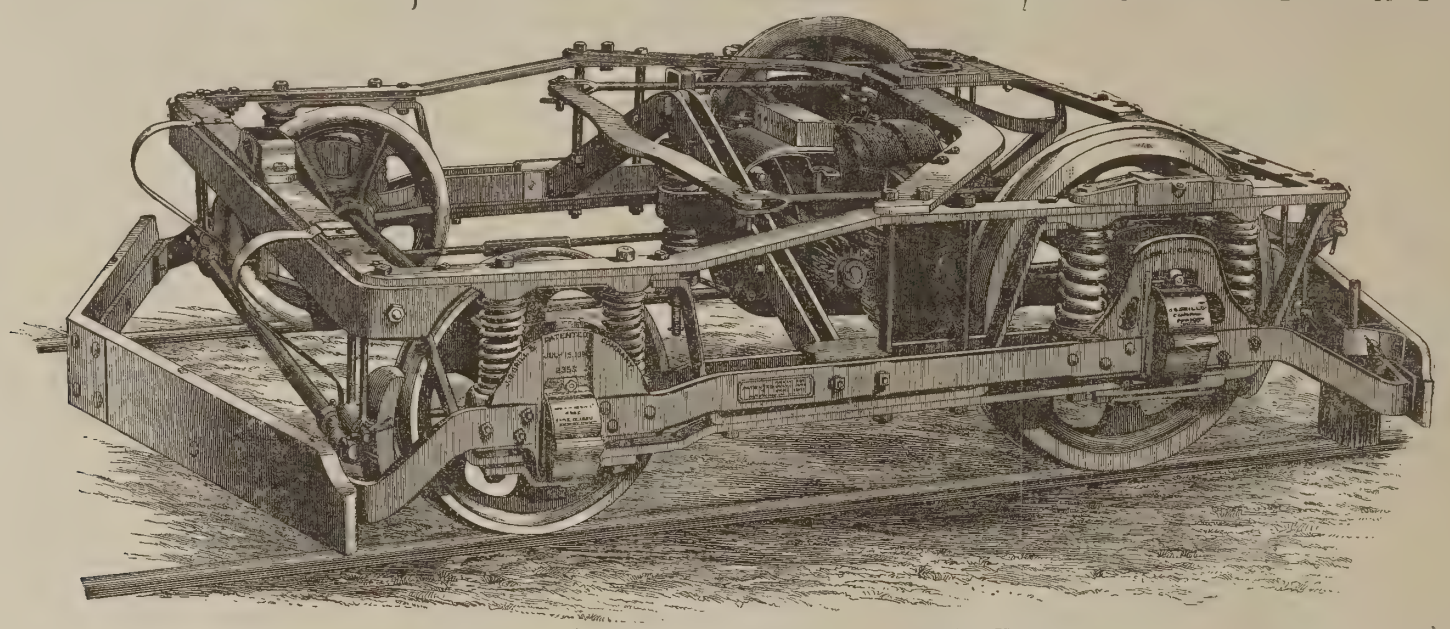
The substitution of electricity as a motive power, and the consequent increase in traffic, have resulted in the adoption of much longer cars.

The 16-foot car body which was considered standard a few years ago has gradually increased in length until it now exceeds, in many cases, the limits which can be carried on a four-wheeled truck.

In adopting two ordinary 4-wheeled pivotal trucks in place of a single rigid truck, the following disadvantages were met:

First, The loss of traction, as one motor being used on a truck only one-half of the total weight of car and truck is carried on the driving wheels.

Second, The raising of the car body to allow clearance for the wheels to radiate, and where 30-inch wheels are used, it necessitates two steps.



Third, The long wheel base, which renders the passage around curves of short radius very difficult.

These objections are overcome in the truck illustrated above by the mechanical arrangement as follows: By using driving wheels of 30 inches diameter, and the trailing or guide wheels of 22 inches diameter, placing of the pivotal center only 3 inches inside of the center of the driving axle, and thus, of course, out of the center of the truck where the pivot usually is placed; and carrying the weight of the car on the upper truck frame, 92½ per cent. being imposed directly over the driving axles, the pivot plates being merely used to draw the car without supporting any weight, as the weight comes upon the "rub plates."

Owing to the pivotal center being so close to the center of the driving axle the radiation of the driving wheels is so slight as to allow them to set up between the outside sills and the stringers, while the smaller guide wheels radiate below the car body.

The wheel base is reduced to 4 feet in a standard gauge truck, and can be made less if desired.

The height of the car body is reduced 1½ inches lower than a car mounted on ordinary rigid independent trucks, making only one step necessary.

The trucks radiate freely and pass easily around curves of 30 feet radius; 93 per cent. of the load is utilized for traction, preventing the slipping of driving wheels and burning out of motors. About 7½ per cent. of the load is placed on the small wheels by a rub plate on the transverse portion of the upper frame, preventing any tendency in the small end to tip upward or climb the rails.

The truck will run in either direction with equal safety.

The motor is carried as usual, one end sleeved on the driving axle and the other end supported on Brill's patented axle box frame, and can be made with either upper or lower suspension.

When used under open cars having side steps extending the whole length of the car body, the journal boxes for the smaller pair of wheels are mounted on the axles between the wheels. This reduces the total width of the small or radial end of the truck 21 inches and allows the truck to radiate without interfering with the side steps.

Actual operation has demonstrated the following facts:

Less power is required for propelling cars mounted on maximum traction trucks than where the weight is evenly distributed on eight wheels.

Up to 25 per cent. is saved in electromotive force over any other truck. This is due to the fact that over 92½ per cent. of the weight is on the driving wheels, making it practically a four-wheeled car. The small wheels acting merely as guide wheels, and also for the reason that there is less vibration and oscillation because of the pivot being outside of the center of the truck.

Very little additional power is consumed in passing around curves, the result of having a very short wheel base.

The Railroad Lighting and Manufacturing Company, of Philadelphia, Pa., proprietors of the Frost dry carbureter system of car lighting, report business as very good. Their system of lighting is now in use on a large number of railroads, among them the Chicago, Burlington & Quincy Railroad, and the East Tennesse, Virginia & Georgia Railroad (Queen & Crescent route). The former is having this system applied to 20 new passenger cars they are now having built, and the latter to 21 cars which are being built by the Barney & Smith Co., and to five Mann boudoir cars that are being repaired, the oil lamps formerly used on these cars having been taken out and the Frost dry carbureter system used instead.

Car Heating Appliances.

Editor National Car and Locomotive Builder:

To manufacturers and users of railway car heating apparatus and all others whom it may concern:

Please take notice that I am the sole owner of the reissued letters patent for means for heating railway cars granted to me as assignee of John G. C. Searle, upon the 29th day of September, 1891, No. 11,196, the same being a reissue of No. 11,170, dated June 2, 1891, which was a reissue of No. 11,101, dated Aug. 5, 1890, the latter being a reissue of the original letters patent No. 370,897, dated the 4th day of October, 1887.

It is one object of the patented invention to provide a water heating apparatus consisting of circulating pipes and an expansion chamber, with an overflow or waste pipe leading from the water level of said chamber, and a sand valve by which any surplus water may be removed without cooling the water in the circulating system.

It is a further object of said invention to provide a water heating apparatus, consisting of circulating pipes and an expansion chamber with an overflow, or waste pipe, leading from the water level of said expansion chamber, and a hand valve for retaining the heated water of circulation at a proper level, when the apparatus is in use.

Please take notice, also, that I have granted an exclusive license under said letters patent to the National Car Heating Company, of Topeka, Kan., of which corporation Mr. N. R. Baker is president, the offices of the company being at 436 Rookery Building, Chicago, Ill.

You are particularly cautioned, therefore, against manufacturing, buying, selling, using or procuring to be manufactured, bought, sold or used, any heating apparatus containing the said invention, or any material and substantial part thereof, except you shall buy the same from the said National Car Heating Company.

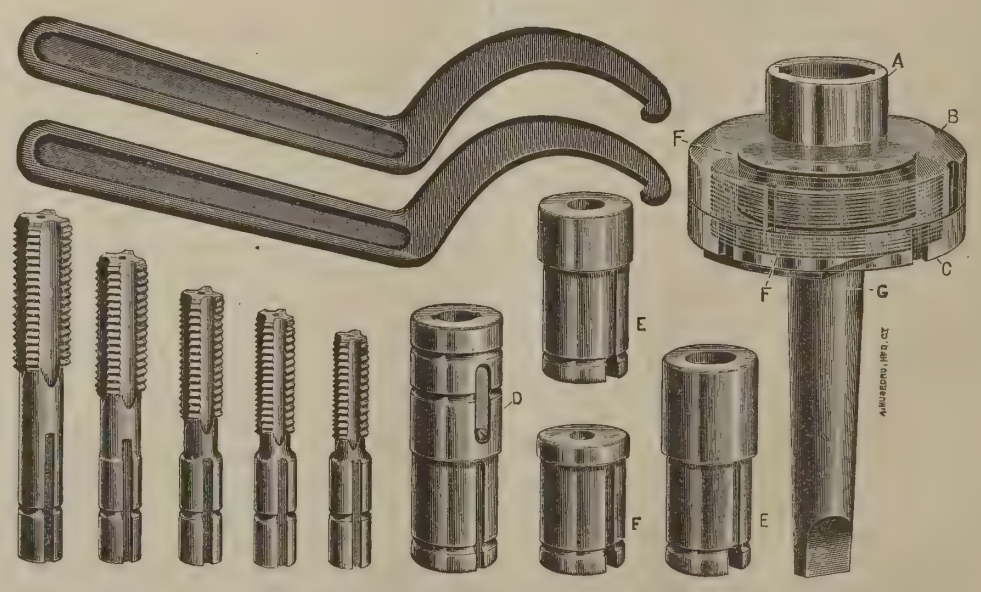
Any person, firm or corporation disregarding the exclusive rights under said reissued patent will be prosecuted in a suit for infringement without further notice or delay, and litigation will be pushed vigorously to any extent necessary in order to protect the rights vested in me as assignee by the grant of said letters patent. JULIA E. SEARLE.

CHICAGO, Ill., Nov. 19, 1891.

Safety Drill and Tap Holder.

Of all the labor performed in the machine shop, that of tapping is one of the most laborious. And although tapping machines have been in use for some time, yet they are generally neither designed nor intended for general work, and it is a singular fact that it is only very recently that any attempt has been made to do the work by any other method than that used fifty years ago. Of late several devices have been made for the purpose, intended for use in the upright drill, and doing the work by power, thereby effecting a great saving in time, as well as doing the work more accurately than was formerly the case.

The safety drill and tap holder herewith illustrated is made by Beaman & Smith, Providence, R. I.



SAFETY DRILL AND TAP HOLDER.

In construction the holder is very simple. There is nothing to break or get out of order, and no complicated parts, and its operation is easily understood. If properly used it is impossible to break either drill or tap, and the change from one to the other can be made instantly and without stopping the machine,

The holder consists of a body *G* screw threaded upon the outside and recessed to receive the friction socket *A*, with the taper shank fitted to the spindle of drill or lathe. The friction socket *A* receives the drill socket *E* and the tap sockets *D*, and it is held between two pieces of vulcanite fiber *F*, and driven by the friction obtained by tightening the friction cap *B*, so that the friction produced will be sufficient to drive the drill or tap but will slip so soon as the tap bottoms. Then by reversing the motion of the driving spindle the tap is withdrawn. The tap socket and tap being driven by feathers prevents all danger of stripping the thread. Special taps, as shown, are recommended, but special tap sockets can be furnished to take the usual square shank hand taps.

C. K. Bullock, 1361 Ridge Avenue, Philadelphia, Pa., is making a number of special tools for use in machine shops, among them a portable drill (Halsey's patent) which is a very handy tool and one that will be very much used.

The new shops of the J. J. Brill Company, at Mount Moriah, Pa., although very large are not equal to the amount of business done by this company; additional buildings are now in course of construction to enable them to keep up with their orders.

The James Spear Stove and Heating Company report heavy orders of late for their *new caboose stove.* Their long experience in car heating qualifies them well to know the needs of the service, and this new caboose stove, they claim, embraces every feature essential to safety, convenience and satisfactory cooking and heating in the "tail coach." Sample stoves are furnished any road, subject to approval.

There has been a good deal of discussion among the electric companies, and also in the different publications that pay attention to such matters, as to the possibility of electric locomotives succeeding steam locomotives in the operation of passenger and freight trains. The Thomson-Houston Electric Company has for the past year been paying a great deal of attention to this subject, and has to-day at the factory, as a result of this attention, a locomotive which is constructed with a view to moving freight cars which are to-day handled by steam locomotives.

We have received from the Marshall Car & Wheel Co., Marshall, Tex., a pamphlet giving an account of tests of chilled wheels made by this company, and also containing testimonials from a number of railway master mechanics certifying to the fine quality of the wheels. The tests made were with the M. C. B., standard drop, which they went through very successfully, some of them standing from 30 or 40 blows of the drop.

Boilers and Staybolts.

In shops for the construction and repair of locomotives, it is well known that in many instances the most troublesome jobs in hand are the drilling and tapping of staybolt holes and the removal and replacing of old and broken staybolts. Having this in view, Mr. J. T. Connelly, of Milton, Pa., a boiler-maker of long experience, has devised some ingenious tools for this purpose. These include radial taps, which are especially adapted for tapping holes which are long distances apart, as, for instance, from the outer shell of the boiler to the crownsheet, or from side to side. The device for tapping the holes is shown in Fig. 1 herewith, in which are two corresponding screw-taps provided with exterior threads and having a central bore extending entirely through the taps and provided with a thread. Through this central bore there is passed a spindle externally threaded to correspond to the bore. This spindle may be of any desired length, and the screw taps are mounted upon it, as shown, being thus adapted to work toward each other and to be guided by the spindle in a straight line. In operation this may be used by two men at the same time, one working from the inside and the other from the outside. One tap is secured upon the spindle far enough to have a firm bearing, and the spindle is then passed through the holes to be threaded until the end of the tap enters the adjoining sheet and the other end extends or projects far enough from the hole in the other sheet to receive the other tap, which is then secured upon the project ing end of the spindle; the taps are run into the respective sheets and the bolt holes are threaded. The great advantage of this arrangement is that the taps are guided in a perfectly straight line, even where the holes are long distances apart, and the threads cut in both sheets correspond.

The second device is for drilling out or removing old or broken staybolts without displacing any parts of the engine, and is best shown in operation, as in Fig. 2. Here there is used an externally threaded tubular guide, which is screwed into the thread of the old staybolt hole of the firebox sheet and made to approach the part of the bolt in the outer sheet. The portion of the broken bolt in the firebox sheet can be readily removed in the usual way, as it is always accessible from the inside. The guide will approach the portion of the bolt in the outer sheet in a straight line, as its direction will be determined by the thread in the inside sheet. When it has been screwed in far enough, or so as to approach the broken bolt end, it can be locked in position by the jam-nut shown. The drill is then passed through the guide and may be readily driven to accurately drill out or remove the bolt. In case a drill with a larger point, which will drill out the full-size hole, is preferred, the drill stem may be passed through from the front end of the nut. This arrangement is shown in the lower hole in Fig. 2. It will be seen that even where the staybolts which are broken come inside the frames or other portions of the engine, no part will have to be moved as long as the inside of the firebox is accessible.

Another device, which is shown in Fig. 3, is intended to tap holes in the plates of locomotive boilers at points which are not accessible from the outside, a case which frequently occurs in actual practice. Here also the arrangement can best be shown in operation. The holes having been drilled as already has been shown, the spindle with the enlarged end is placed in the holes to be threaded, the enlargement entering the hole in the outer shell. The taper tap is then placed on the spindle, and the hole in the firebox sheet is threaded from the inside. The enlarged end of the spindle fitting the hole in the outer sheet and the tap the hole in the inner sheet, the latter will be guided in a straight line and forced to cut a thread corresponding in direction and pitch with that of the outer sheet. When the hole in the firebox is threaded, the tap and spindle are removed, and the spindle having the threaded end and round nut is substituted, the nut being placed in the hole of the outer sheet as shown. This affords a firm bearing for the spindle and will necessarily guide the plug tap in a straight line, at the same time allowing it to enter and cut its thread in the whole of the outer sheet until the end touches the round nut, when, by pulling back on the spindle and turning it, the nut will be unscrewed and dropped down by the side of the firebox The tap, however, will then have a firm bearing, and the threading of the outer hole can be completed. The threads will then necessarily be in a straight line and will correspond, the tap being guided by the thread already made in the firebox sheet and by the nut in the outer sheet.

The saving in time and expense in making repairs on a locomotive by the use of these devices can readily be understood by those who have had similar work to attend to. These devices have been fully tested in practical use.

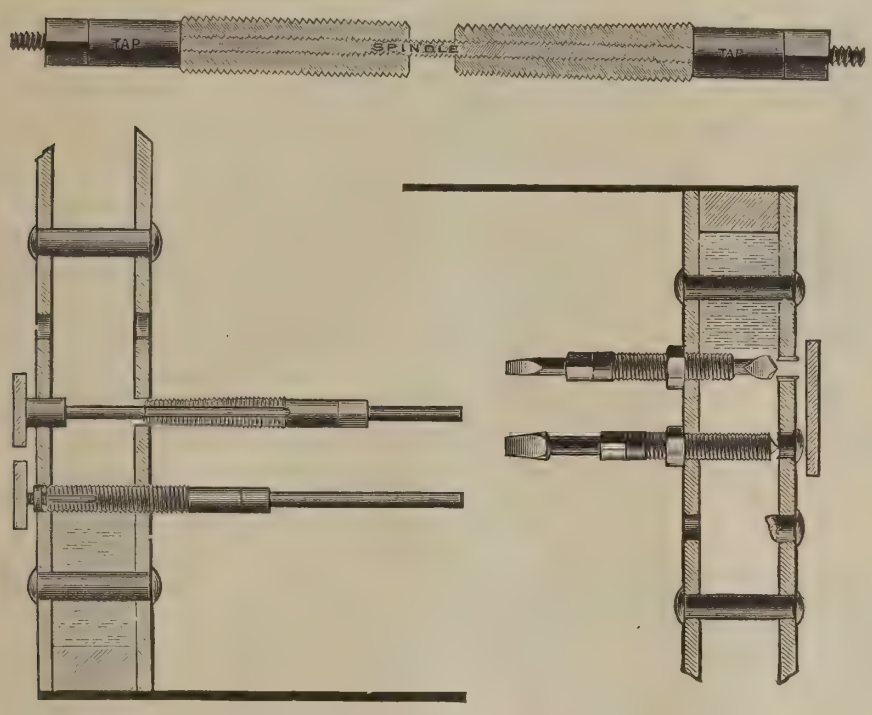


FIG. 3.

FIG. 2.

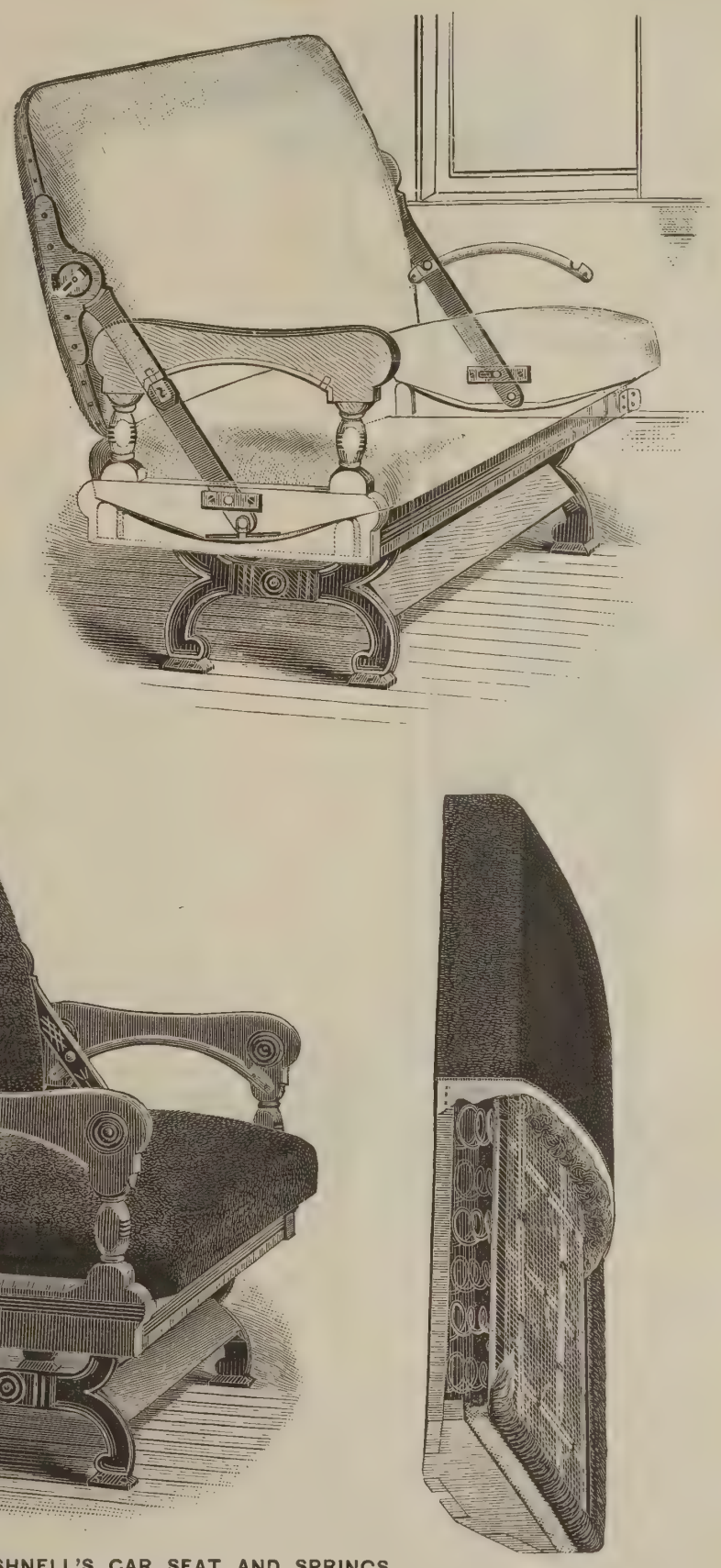
Modern Car Seats.

While the advancement in cars known as ordinary passenger coaches has been very great in the last few years, and has reached a point of perfection almost, so far as interior finish and appointments are concerned, there still remains an open subject, viz.: the best and cheapest seat to be used.

The old stereotyped seat with iron frame and low, reversible back is a thing of the past, and, to produce the most popular and simple car seat, which will embody comfort and durability at moderate cost, has been the sole object of several manufacturers in this line.

The E. L. Bushnell Spring Co., Ltd., of Poughkeepsie, N. Y., claim their new seat, as shown and described, to be the best and cheapest seat yet produced; containing, as it does, the patent Bushnell springs, which have stood the test for a dozen years with a record second to none, and in many cases having outlived the cars in which they were originally placed; in fact the indorsement of their springs has been such that no radical improvements have been found necessary by this company to do a largely increasing business every year, while others have been putting forth new devices and designs to overcome objections found upon practical tests of their goods.

The E. L. Bushnell Spring Co. now have four good clean patents on this seat, styled by them as No. 90 Car Seat, and earnestly solicit an opportunity to furnish samples, free of expense, and quoting prices, feeling confident of their ability to give railroads better value for less money than any other manufacturer.



BUSHNELL'S CAR SEAT AND SPRINGS.

The New York Air Brake Company, at Watertown, N. Y., are worked to their fullest capacity to keep up with their orders, although employing at the present time upward of 600 men.

The International & Great Northern Railroad are having ten 10-wheelers built at the Cooke Locomotive Works, the order for same having been secured by their well known Southern representative, Mr. J. V. Motter.

The Brown & Sharpe Manufacturing Company, of Providence, R. I., have published a new edition of their treatise on the construction and use of milling machines. The treatise gives detailed information about the construction and use of this highly valuable class of tools and adds many interesting facts that are of the first importance to machinists and others connected with the working of metals. The Universal milling machine has all its sizes and attachments illustrated and described. The same is done for all the forms of plain milling machines. A great part of the treatise is devoted to millers, their care, and the proper methods of using them. The treatise forms a useful hand book for those having charge of milling machines.

The Morton Safety Heating Co., of Baltimore, Md., have received an additional order from the Grand Trunk Railway to heat their cars with the Morton system. They have also equipped a train running between Richmond and Norfolk, Va., and several street railways in Pittsburgh, Pa., and other cities.

Berry Bros., Detroit, Mich., have issued a handsome and artistic illustrated catalogue, showing their works and the operations of varnish making. The pictures give a very good graphical description of varnish making.

The Congdon Brake Shoe Company has issued a very neat illustrated catalogue of the Meehan brake shoe. Interesting particulars are given about the use of this shoe, which is said to be the most durable and uniform shoe made without exception. The combination of steel and iron gives wonderful durability, and if its value is considered apart from the beneficial effects above described, it is found that this shoe, which will outwear several sets of cast-iron shoes, is much cheaper than the common or any other kind of brake shoe, and from the infrequency of renewals will also save much in the wages of repair men.

N. & G. Taylor Co. Philadelphia, manufacturers of tin plates, have greatly increased their business of late. For some time they have had a daily output of 40 boxes,and this has now been increased to 100 boxes. They are making a specialty of roofing plate which is made on imported steel plates covered with a special mixture of tin and lead. A mill near Front and Laurel streets is turning out every day a score or more of boxes of the American roofing plate thus prepared. This mill has been in operation just two months, and, with the exception of a plant at Pittsburgh, it is the only one in Pennsylvania. At the close of two months operations the proprietors of the manufactory maintain that they can produce a first-class article of roofing tinplates as cheaply as they can be made in England or Wales, plus the duty of $44 per ton. In other words, the consumer can purchase American roofing plate of a good grade for as small a price as he can get the British article and pay the duty thereon of 2½ cents to be collected after July 1, 1891.

R. Mushet's Special Steel.

In our walks abroad and acquaintance with railroad machine shops of the country, it is really remarkable to note the steady increase in the use of the R. Mushet's "Special" steel, and we are really inclined to think that this "steady" "increase" has but just begun, for it is seldom that we hear of a material spoken of with such almost universal satisfaction. The fame of the Mushet's has naturally induced many to try their skill in making something like it; what other manufacturers can do in this direction they probably will do, and it will be quite safe to leave the verdict as to their success in the hands of the machine shops; but it is equally safe to say that up to the present time there is nothing to compare with the "Mushet's" for uniformity, durability and economy in every respect, so far as we have been able to learn—and our acquaintance is a large one.

McIlroy's New Commingler System.

The annexed illustrations show the new and improved McIlroy commingler used in the car heating system of the Consolidated Car Heating Co., as applied on the Canadian Pacific and other railroads. In this commingler system not only is water the heating medium, but an unusually rapid and constant circulation of water in the pipes is kept up, so that all parts of the heating surface are maintained practically at the same temperature. This insures that every part of the car will receive a share of the heat proportional to its part of the radiating surface.

The apparatus for commingling the steam and water is

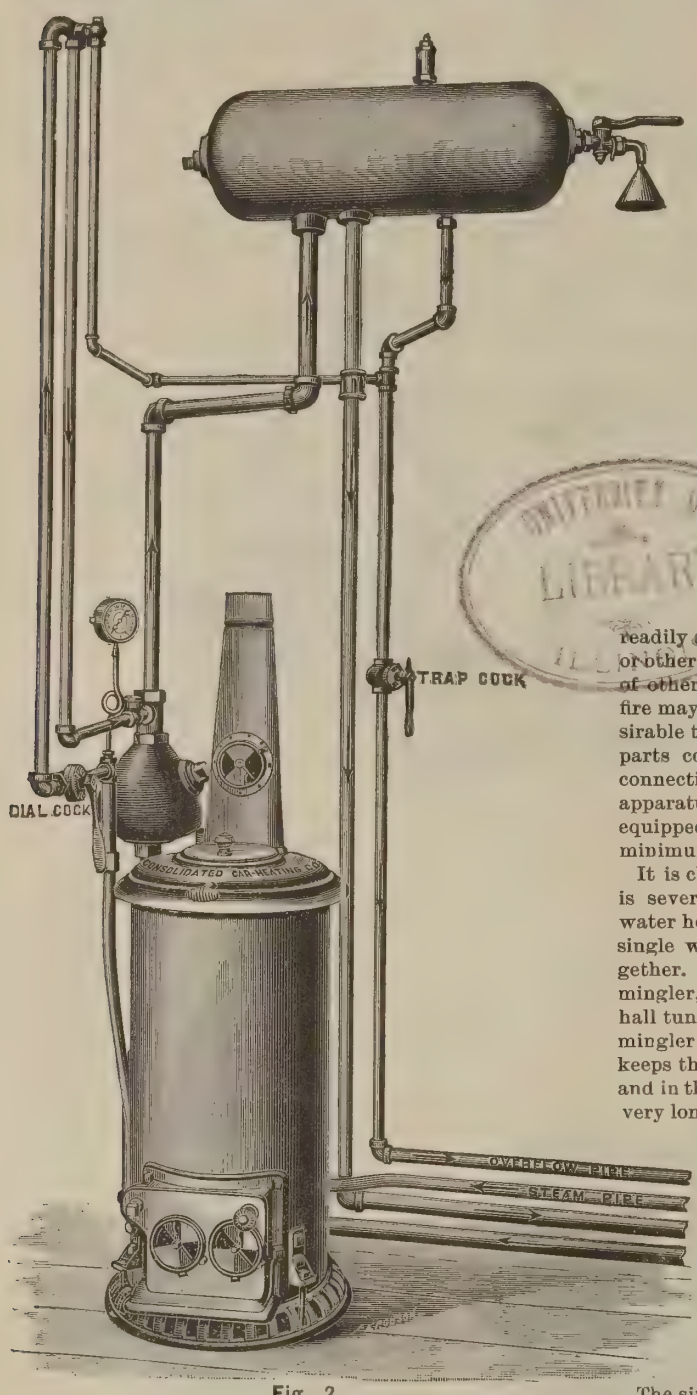


Fig. 2.

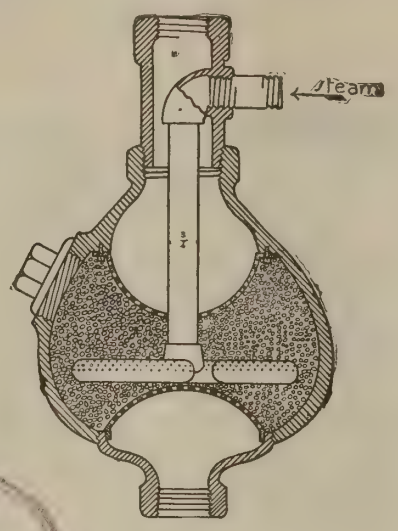


Fig. 1.

readily applied to cars already equipped with the "Baker" or other hot water apparatus without the expensive addition of other pipes. The water heater remains intact, so that a fire may be started at any time should it be necessary or desirable to heat the car when steam is not available. The few parts comprising the commingler system and the simple connections to be made render its application to the heating apparatus with which the greater number of cars are already equipped a simple matter, quickly accomplished and at the minimum of cost.

It is claimed that the heating capacity of the commingler is several times as great as that of any "Baker" or other water heater, and it is capable of heating several cars by a single water circuit could they be properly connected together. As an instance of what can be done by the commingler, we may call attention to the circuit in the Whitehall tunnel ditches on the D. & H. Railway, where one commingler circulates water through over 2,000 feet of pipe and keeps the ditches free from ice in the coldest winter weather; and in the Albany Electric Railway car house there are some very long commingler circulations. It is also true that the amount of heat can be regulated to meet the requirements of the mildest weather where artificial heat is used.

The great capacity of the commingler is due to the direct action of the steam upon the water of circulation, caused by the steam discharging within the body of the water itself. The contact of the steam and water takes place within the pear-shaped body of the commingler proper, a sectional view of which is shown in Fig. 1.

The simplicity and ease of management is evident from the fact that the heating apparatus is controlled by only one valve. It is further simplified by the fact that no thermostatic trap is used, or any other device requiring frequent adjustment or liable to get out of order. No part of the apparatus is placed under the car, where it is liable to freeze. Every part, as will be seen from Fig. 2, is within the car where it can be reached while the train is in motion.

One great objection to "drum" systems has been due to the air which fills the upper half of the expansion drum when a car is pumped up, which air is compressed into a small part of its volume by the expansion of the water when an attempt is made to heat the car. The compression of this air may cause a pressure upon the heating pipes of several hundred pounds per square inch, and sometimes becomes so great that circulation of the water is not only impeded but entirely stopped. This is not an uncommon occurrence, and then the heating system is said to be "air-bound." The pressure thus developed prevents the formation of steam bubbles in the rising column of the circulating system, which is the prime cause of circulation of water in car heating apparatus. The effect is to block the circulation and to increase enormously the pressure on the heating pipes. With the improved commingler system such difficulty is never experienced, due to the fact that the overflow pipe is connected to the air space within the expansion drum, and thus permits the compressed air to escape as the water of the circulating system expands. No air pressure can, therefore, be generated within the circulating pipes, and this doubtless accounts for the rapid circulation of water obtained with the improved commingler.

The American Car Company has been organized in St. Louis, Mo., for the purpose of building street railway cars for all kinds of motive power; they will also build elevated and suburban railway coaches. Their main building is 1,110 feet long by 150 wide, divided by fireproof walls. Their property covers about four acres of ground, and is situated on the old Manchester road near Lower Grove avenue. Their down town office is in the American Central building.

Post & Co., of Cincinnati, O., manufacturers of railway supplies, had, at the Street Railway Convention, held at Pittsburgh, Pa., one of the largest and finest exhibits of car lamps, car and locomotive furnishings and electrical supplies that has ever been shown at a Railway Convention.

Our Directory.

Boston & Maine.—C. H. Wiggin has been appointed master mechanic of the Concord division.

Charleston & Savannah.—H. A. Ulmo, master mechanic, has resigned.

Chicago & Eastern Illinois.—T. Anderson has been appointed master car builder, vice Wm. Apps, resigned.

Chicago, St. Paul & Kansas City.—A. F. Priest has been appointed master mechanic St. Joseph & Des Moines division.

Des Moines & North Western.—L. M. Martin has been appointed general manager with headquarters at Des Moines, Iowa.

Farmville & Powhatton.—R. F. Kredell has been appointed master mechanic with office at Chester, Va.

Green Bay, Winona & St Paul.—F. B. Seymour has been appointed superintendent with office at Green Bay, Wis.

Gulf, Colorado & Santa Fe.—J. Billingham hss been appointed master mechanic vice C. F. Ward resigned.

Illinois Central.—T. P. Bellows has been appointed division superintendent in New Orleans. John Turner, superintendent of the Louisiana division of the Illinois Central, has resigned. W. B. Snow, master car builder, resigned his position Oct. 1, and has been succeeded by Wm. Apps.

Indianapolis, Decatur & Western.—R. B. F. Pierce has been appointed general manager.

Lake Erie & Western.—Geo. T. Jarvis has been appointed general superintendent, vice D. S. Hill, resigned.

Mason City & Fort Dodge.—R. H. Emerson has been appointed master mechanic, vice B. Rieley, resigned.

Mexican Central.—J. S. Turner has been appointed master mechanic of the third division.

Minneapolis & St. Louis.—John Tonge has been appointed master mechanic to succeed W. H. Whitaker, resigned.

Newport News & Mississippi Valley.—S. W. Mullinix has been appointed division master mechanic, with headquarters at Paducah, Ky.

Old Colony.—C. A. McAlpine has been appointed superintendent of the Northern Division, with headquarters at Framingham, Mass.

Pittsburgh & Western.—T. Anderson has been appointed master car builder.

St Louis & Hannibal.—Geo. B. Clason, general manager, has resigned. W. T. Kennedy has been appointed superintendent.

"THE BEST OF CHILDREN'S MAGAZINES."

The publishers of "St. Nicholas," that famous young folks' magazine, are offering to send a sample copy, free of charge, to any father or mother who would like to consider the question of taking a children's magazine during the year to come.

Certainly if that question is up for discussion in any household "St. Nicholas" will be the magazine selected. From its first number, in 1873, the pens of the greatest writers of the English world, and the pencils of the most famous illustrators, have been at its service. Tennyson, Longfellow, Bryant, Thomas Hughes, Whittier, Bret Harte, Bayard Taylor, Mrs. Burnett, Miss Alcott, Donald G. Mitchell, George Macdonald, Mrs. Oliphant, Professor Proctor are a few of the many great names which have been upon its list of contributors. Mrs. Mary Mapes Dodge is the editor. Everything in it is illustrated.

IN 1892

there are to be serial stories by Brander Matthews, Lieutenant Robert H. Fletcher (the author of that charming book, "Marjorie and Her Papa"), Laura E. Richards, William O. Stoddard, Charles E. Carryl (the author of "Davy and the Goblin") and Frances Courtenay Baylor. There will be short stories by Thomas Nelson Page, Mary E. Wilkins, Mary Hallock Foote, Richard Malcolm Johnston, Octave Thanet, General O. O. Howard and many others, with papers of travel and adventure by J. T. Trowbridge and Lieutenant Schwatka, and useful articles on "How Columbus Reckoned," "William the Conqueror," "Volcanoes and Earthquakes," "Straight Lines and Circles," etc. In "Strange Corners of Our Country," the Great American Desert, the Cliff-Dwellings of Arizona, and other interesting places will be described, and in "Honors to the Flag," and "Boys and the National Guard" the patriotism of the youngreaders will be aroused and stimulated. Julian Ralph is to describe "The Making of a Great Newspaper," and the arc and incandescent electric lights are to be clearly explained.

APPLIED CHRISTIANITY

is what "St. Nicholas" teaches;—unselfishness, faithfulness, courage, truthfulness—these things are taught in a hundred ways by stories, poems and pictures. Do you need such an assistant in your work with your boys and girls? If so, and if you are not already familiar with "St. Nicholas," send a postal card to The Century Co., Union Square, New York, N. Y., and ask to see a sample copy. A year's subscription to "St. Nicholas" makes a splendid Christmas present, for it brings Christmas twelve times a year.

A GREAT MAGAZINE.

The Century's Programme in 1892—A New "Life of Columbus"—Articles for Farmers, etc.

That great Americam periodical, "The Century," is going to outdo its own unrivaled record in its programme for 1892, and as many of its new features begin with the November number, new readers should commence with that issue.

In this number are the opening chapters of

"THE NAULAHKA,"

a novel by Rudyard Kipling, the famous author of "Plain Tales from the Hills," written in collaboration with an American writer, Wolcott Balestier. It is the story of a young man and a young woman from a "booming" Colorado town, who go to India, he in search of a wonderful jeweled necklace, called "the Naulahka" (from which the story takes its name), and she as a physician to women. The novel describes their remarkable adventures at the court of an Indian maharajah. Besides this, "The Century" will print three other novels during the year, and a great number of short stories by the best American story writers.

The well known humorist Edgar W. Nye ("Bill Nye") is to write a series of amusing sketches which he calls his "autobiographies," the first one of which, "The Autobiography of a Justice of the Peace," is in November. This number also contains a valuable and suggestive article on "The Food Supply of the Future," which every farmer should read, to be followed by a number of others

OF GREAT PRACTICAL VALUE TO FARMERS,

treating especially of the relations of the Government to the farmer, what it is doing and what it should do. This series will include contributions from officers of the Department of Agriculture, and other well known men will discuss "The Farmer's Discontent," "Co-operation," etc., etc.

A celebrated Spanish writer is to furnish a "Life of Columbus," which will be brilliantly illustrated, and the publishers of "The Century," have arranged with the managers of the World's Fair to print articles on the buildings, etc.

One of the novels to appear in 1892 is

A STORY OF NEW YORK LIFE

by the author of "The Anglomaniacs," and the magazine will contain a great deal about the metropolis during the year; among other things a series of illustrated articles on "The Jews in New York." In November is an illustrated description of "The Players' Club," founded by Edwin Booth, and one of the features of the splendidly illustrated Christmas (December) number is an article on "The Bowery."

To get "The Century" send the yearly subscription price ($4.00) to The Century Co., Union Square, New York, N. Y.

Wanted.

WANTED.—A painter understanding his business, is practical and up with the times, has had charge of shop, wishes an engagement as foreman. Address H. B. P., care of this office.